MATH 1111 College Algebra FINAL EXAM REVIEW

Directions: This is a review of all topics covered during the term.

Question: 1
Simplify. \(\frac{1}{256^4}\)

(A) 64  
(B) 4  
(C) 16  
(D) \(\frac{1}{256^4}\)  
(E) None of the above

Question: 2
Simplify. \(\left(\frac{125}{64}\right)^{\frac{2}{3}}\)

(A) 25  
(B) 16  
(C) \(\frac{25}{16}\)  
(D) \(\frac{16}{25}\)  
(E) None of the above

Question: 3
Radium radioactively decays according to the function
\[ R(t) = R_0 e^{-0.004t} \]
where \(R_0\) is the original sample amount and \(R(t)\) is the final amount remaining after \(t\) years. Beginning with a 14 mg sample, how much remains after 10 years?

(A) 13.45 mg  
(B) 14.75 mg  
(C) –1.52 mg  
(D) 13.94 mg  
(E) None of the above

Question: 4
The Richter scale magnitude \(R\) of an earthquake of intensity \(I\) is defined as
\[ R = \log \left( \frac{I}{I_0} \right), \]
where \(I_0\) is a small threshold intensity. Find the intensity \(I\) (in multiples of \(I_0\)) of an earthquake in Turkey with a magnitude of 7.5.

(A) 1,808 \(I_0\)  
(B) 563,135,147 \(I_0\)  
(C) 7,500 \(I_0\)  
(D) 31,622,776 \(I_0\)  
(E) None of the above
Question: 5

The population of Tucson, AZ has been rising according to the model \( A = p \cdot e^{0.036t} \), where \( p \) is the population in 1990 and \( A \) is the population \( t \) years later. If Tucson's population was 468,000 in 1990, when is the city expected to reach 1 million people?

(A) 1998  
(B) 2011  
(C) 1993  
(D) 1948  
(E) None of the above

Question: 6

Solve for \( x \), given the following right triangle:

\[
\begin{align*}
x & \quad 3x - 2 \\
2(x+1) & \quad x
\end{align*}
\]

(A) 4  
(B) No solutions  
(C) 7  
(D) 5  
(E) None of the above

Question: 7

Write the equation of a line in slope-intercept form that passes through \((-3, \frac{20}{3})\) and \((1, \frac{4}{3})\).

(A) \( y = 4x + 15 \)  
(B) \( y = \frac{4}{3}x + \frac{8}{3} \)  
(C) \( y = -\frac{4}{3}x - \frac{19}{3} \)  
(D) \( y = 2x + 7 \)  
(E) None of the above

Question: 8

Multiply. 

\[
\begin{align*}
18 \cdot \frac{5}{5} & \quad 18 \\
\frac{5}{9} & \quad \frac{18}{45}
\end{align*}
\]

(A) 18  
(B) 23  
(C) 23  
(D) 2  
(E) None of the above

Question: 9
Using the compound interest formula, how much would you have to invest at 7% interest, compounded quarterly, to have $15,000 in 20 years?

(A) $6,689.43  
(B) $3,744.02  
(C) $10,702.27  
(D) $24,960.13

**Question: 10**

A company has a fixed cost of $27,500/month when it is producing printed tapestries. Each item that it makes has its own cost of $35. How much profit would the company generate if it signed a large order for 2400 of its tapestries selling each item for $59?

(A) $30,100  
(B) $49,100  
(C) $57,600  
(D) $114,100  
(E) None of the above

**Question: 11**

What change do you have to make to the graph of \( f(x) = 7^x \) in order to graph the function \( g(x) = 7^{x+10} \)?

(A) Shift the graph to the right 10 units.  
(B) Shift the graph to the left 10 units.  
(C) Shift the graph to the right 7 units.  
(D) Shift the graph to the left 7 units.  
(E) None of the above

**Question: 12**

Given an equilateral triangle with side \( s \), write a function for the area of the triangle in terms of \( s \).

(A) \( \frac{1}{4} s^2 \sqrt{3} \)  
(B) \( \frac{1}{2} s^2 \sqrt{3} \)  
(C) \( \frac{3}{2} s^2 \)  
(D) \( \frac{\sqrt{2}}{3} s^2 \)  
(E) None of the above

**Question: 13**

True or false? \( 5^3 = 125 \)

(A) true  
(B) false

**Question: 14**
True or false?

\[
\frac{(4xy^2)^2}{(4x)^2} = y^2
\]

Assume that all variables represent nonzero numbers.

**Question: 15** QID: 5755

The power in an electric circuit varies inversely with the resistance. If the power is 1200 watts when the resistance is 12 Ohms, find the power when the resistance is 6 Ohms.

(A) 1,400 watts  
(B) 1,800 watts  
(C) 2,400 watts  
(D) 2,000 watts  
(E) None of the above

**Question: 16** QID: 5759

Kepler’s law states that if one object is in orbit around another, the square of the time it takes that object to complete a revolution varies directly with the cube of the average radius of the orbit. How is the time affected if the average radius is doubled?

(A) \(4T^2\)  
(B) \(8T\)  
(C) \(2\sqrt{2}T\)  
(D) \(2T\)  
(E) None of the above

**Question: 17** QID: 5765

True or false?

\[
\frac{2}{3^{-1}} = \frac{3}{2}
\]

(A) true  
(B) false

**Question: 18** QID: 5942

Evaluate the following and express the result in scientific notation.

\[0.025 \cdot 16,000\]

(A) \(4.1 \times 10^2\)  
(B) \(4.0 \times 10^{-8}\)  
(C) \(4.0 \times 10^6\)  
(D) \(4.0 \times 10^2\)  
(E) None of the above

**Question: 19**

True or false?

\[
\frac{1}{x^3} + \frac{1}{x^2} + \frac{1}{x}
\]

is a polynomial.

(A) true  
(B) false
Question: 20

Factor:
6z^2 - z - 1

(A) (2z + 1)(3z - 1)
(B) (2z - 1)(3z + 1)
(C) (6z + 1)(z - 1)
(D) (6z - 1)(z + 1)
(E) None of the above

Question: 21

Solve for g.
3(g - 7) - 2 = 4

(A) 9
(B) 13/3
(C) -19/3
(D) 23/3
(E) None of the above

Question: 22

Solve for x.
-(3 + x) - (7 - x) - 3 = -(2 - x) + (-x) + 1

(A) 3
(B) -7
(C) 6
(D) There is no solution; this is a false statement.
(E) None of the above

Question: 23

Factor.
4x^2 - 4x + 1

(A) (x - 4)^2
(B) (x + 4)^2
(C) (2x - 1)^2
(D) (2x + 1)^2
(E) None of the above

Question: 24

Factor.
4p^2 - 25

(A) (2p + 5)(2p - 5)
(B) (2p - 5)(2p + 5)
(C) (4p^2 + 5)(4p^2 - 5)
(D) (2p^2 + 25)(2p^2 - 25)
(E) None of the above

Question: 25

QID: 7716
Factor: $x^3 - 343$

(A) $(x - 3)(x^2 + 3x + 9)$
(B) $(x - 49)(x^2 + x + 7)$
(C) $(x - 7)^3$
(D) $(x - 7)(x^2 + 7x + 49)$
(E) None of the above.

**Question: 26** QID: 7905

Factor.
$9w^4z^3 - 54w^3$

(A) $9w^3(wz^3 - 6)$
(B) $9w^3(wz^3 + 6)$
(C) $(3w^2z + 9w)(3w^2z^2 - 6w)$
(D) $(3wz + 6)(3wz - 6)$
(E) None of the above

**Question: 27** QID: 7960

True or false?
The domain of $\frac{9}{x^2 + 9}$
is all $x$'s except $x = 3$ or $x = -3$.

**Question: 28** QID: 8182

Simplify.
$\frac{x^2 + 4x - 12}{x^2 - x - 42}$

(A) $\frac{x - 2}{x - 7}$, $x \neq -6, 7$
(B) $\frac{x + 2}{x + 7}$, $x \neq -6, 7$
(C) $2x^2 + 3x + 30$, $x \neq -6, 7$
(D) $\frac{4x - 12}{-x - 42}$, $x \neq -6, 7$
(E) None of the above

**Question: 29** QID: 8271

Simplify.
$\frac{x^2 - 6x}{5} \cdot \frac{10}{2x - 12}$

(A) $x$, $x \neq 6$
(B) $1$, $x \neq -6$, $x \neq -2$, $x \neq 1$, $x \neq 7$
(C) $-1$, $x \neq -6$, $x \neq -2$, $x \neq 1$, $x \neq 7$
(D) $\frac{(x + 1)(x + 2)}{(x - 1)(x - 2)}$, $x \neq -6$, $x \neq -2$, $x \neq 1$, $x \neq 7$
(E) None of the above

**Question: 30**
Simplify:
\[
\frac{1}{4y} - \frac{1}{y+7} + \frac{1}{y-1}
\]
(A) \(\frac{y^2 + 38y - 7}{4y(y+7)(y-1)}\), \(y \neq -7,0,1\)
(B) \(\frac{1}{4y-8}\), \(y \neq -1,0\)
(C) \(-\frac{1}{4y(y+7)(y-1)}\), \(y \neq -7,0,1\)
(D) \(\frac{9y^2 + 30y - 7}{4y(y+7)(y-1)}\), \(y \neq -1,0,7\)
(E) None of the above

Question: 31

Simplify. Assume that all variables result in nonzero denominators.
\[
\frac{1}{w^2 - 3w - 4} + \frac{1}{w + 3}
\]
\[
\frac{1}{w - 4} - \frac{1}{w^2 + 4w + 3}
\]
(A) \(\frac{w^2 - 2w - 1}{w^2 + 3w + 7}\)
(B) \(\frac{w^2 - 2w - 1}{w^2 + 7w + 1}\)
(C) \(-1\)
(D) \(\frac{w^2 + 3w + 7}{w^2 - 2w - 1}\)
(E) None of the above

Question: 32

Simplify the radical. Assume \(t \geq 0\).
\[
\sqrt[3]{216t^4}
\]
(A) \(6\sqrt[3]{t}\)
(B) \(6t^{\frac{3}{2}}\sqrt{t}\)
(C) \(6t^2\sqrt{t}\)
(D) \(6t\)
(E) None of the above

Question: 33  QID: 8403
Rationalize the denominator of the following expression:
\[
\frac{6}{5 - \sqrt{19}}
\]

(A) \( \frac{5 + \sqrt{19}}{6} \)
(B) \( \frac{30 + 6\sqrt{19}}{14} \)
(C) \( \frac{5 - \sqrt{19}}{14} \)
(D) \( \frac{5 + \sqrt{19}}{14} \)
(E) None of the above

Question: 34    QID: 8414

True or false?
\[-\sqrt{-20} = -2\sqrt{5}\]

(A) True
(B) False

Question: 35    QID: 8465

Simplify.
\[i^4\]

(A) \( i \)
(B) \( -1 \)
(C) \( -i \)
(D) \( 1 \)
(E) None of the above

Question: 36    QID: 8493

Write the following complex number in standard form.
\[\frac{i}{4 + i}\]

(A) \( \frac{1}{15} + \frac{4}{15}i \)
(B) \( \frac{1}{17} + \frac{4}{17}i \)
(C) \( 1 + 4i \)
(D) \( 17 + 68i \)
(E) None of the above

Question: 37    QID: 8530

Solve for \( y \).
\[
\frac{7y}{y + 9} - 2 = \frac{2}{y + 9}
\]

(A) \( -\frac{16}{5} \)
(B) \( \frac{4}{7} \)
(C) \( 4 \)
(D) No solution
(E) None of the above

Question: 38
Solve for $x$.

\[
\frac{3}{x} - 1 = \frac{5}{4x} - \frac{1}{3x}
\]  

(A) \[\frac{47}{12}\]  

(B) 0  

(C) \[\frac{25}{12}\]  

(D) \[\frac{47}{12}\]  

(E) None of the above

Question: 39

Solve for $l$.

\[S = 2lw + 2lh + 2hw\]  

(A) \[\frac{S - 2hw}{2w + 2h}\]  

(B) \[\frac{S - 2hw - 2w - 2h}{S - 2w - 2lh}\]  

(C) \[\frac{w + h}{2w}\]  

(D) \[\frac{w + h}{2w}\]  

(E) None of the above

Question: 40

A cone has volume \[V = \frac{1}{3} \pi r^2 h\] where $r$ is the radius of the base and $h$ is the height. If a cone has a volume $108\pi \text{ cm}^3$ and the radius is 9 centimeters, find its height.

(A) 3 centimeters  

(B) 4 centimeters  

(C) 27 centimeters  

(D) 36 centimeters  

(E) None of the above

Question: 41

A runner is training by sprinting up a long hill then slowly jogging down. He runs uphill at 240 meters per minute and comes back down at 160 meters per minute. If one circuit up and back takes 30 minutes, how long is the hill?

(A) 2400 m  

(B) 2880 m  

(C) 3600 m  

(D) 6000 m  

(E) None of the above

Question: 42

Two salesmen are visiting houses to sell vacuum cleaners. Together, they can stop at every house in a neighborhood in 2 days, but one salesman covers twice as many houses as the other. If they work together for one day, how long will the slower salesman take to finish the neighborhood?

(A) 2 days 12 hours  

(B) 3 days  

(C) 3 days 12 hours  

(D) 4 days  

(E) None of the above
### Question: 43
Eddie spills his cash register drawer on the floor and has to sweep up the coins. He has 742 coins which are a mixture of pennies, nickels, dimes, and quarters. There are 10 times as many pennies as dimes, and half as many quarters as dimes. If he has $24.60 how many dimes are there?

- (A) 25
- (B) 40
- (C) 50
- (D) 500
- (E) None of the above

### Question: 44
After Terri wins a $100,000 payout in the lottery she donates 20% to charity, gives 25% to her family and friends, spends 14.5% on herself, and pays 30% in taxes. The remainder is in accounts earning simple interest of 14% and 11%. If her total interest is $1335, how much is in each account?

- (A) $4000 at 14%, $4500 at 11%
- (B) $5000 at 14%, $5000 at 11%
- (C) $6000 at 14%, $4500 at 11%
- (D) $7000 at 14%, $3500 at 11%
- (E) None of the above

### Question: 45
One-half the sum of four consecutive integers is 37. Find the integers.

- (A) 17, 18, 19, 20
- (B) 16, 17, 18, 19
- (C) 16, 18, 20, 22
- (D) no solution

### Question: 46
Frank is on a 5 day driving trip across the country. He plans on averaging 10 hours of travel per day. If he has traveled 9, 12, 7, and 10 hours respectively over the first four days of the trip, how many hours does he need to drive on the last day?

- (A) 10 hours
- (B) 11 hours
- (C) 12 hours
- (D) 14 hours
- (E) None of the above

### Question: 47
Amy takes out a loan of $6500 to start a business building and selling rocking chairs. If the chairs cost $35 to build and she can sell them for $100 each, how many must she sell to pay off the loan?

- (A) 183 chairs
- (B) 49 chairs
- (C) 65 chairs
- (D) 100 chairs
- (E) None of the above
Question: 48

Solve for \( w \).
\[ w^2 - 4w - 5 = 0 \]
(A) \(-5\) or \(-1\)
(B) \(-5\) or \(0\)
(C) \(-5\) or \(1\)
(D) \(-1\) or \(5\)
(E) None of the above

Question: 49

Solve for \( x \) by completing the square:
\[ x^2 - 8x = -12 \]
(A) \(-4\) or \(-12\)
(B) \(4 + \sqrt{52}\) or \(4 - \sqrt{52}\)
(C) \(6\) or \(2\)
(D) \(4\) or \(6\)
(E) None of the above

Question: 50

Use the quadratic formula to solve for \( z \).
\[ 2z^2 + z - 1 = 0 \]
(A) \(\frac{1}{2}\) or \(1\)
(B) \(\frac{-1 + i\sqrt{7}}{4}\) or \(\frac{-1 - i\sqrt{7}}{4}\)
(C) \(\frac{1}{2}\) or \(-1\)
(D) \(\frac{1 + \sqrt{7}}{2}\) or \(\frac{1 - \sqrt{7}}{2}\)
(E) None of the above

Question: 51

Solve for \( z \).
\[ x = \frac{y}{(z - 4)^2} \]
(A) \(z = \frac{4x \pm \sqrt{y}}{x}\)
(B) \(z = \frac{4x \pm \sqrt{y}}{x}\)
(C) \(z = \frac{4 \pm \sqrt{y}}{x}\)
(D) \(z = \frac{4 \pm \sqrt{y}}{x}\)
(E) None of the above

Question: 52
Question: 53

Find all real solutions for $x$ for the given equation.

$$9 \left( \frac{x - 3}{x} \right)^2 - 9 \left( \frac{x - 3}{x} \right) - 4 = 0$$

- (A) $\frac{9}{4}$ or $-9$
- (B) $-\frac{4}{3}$ or $3$
- (C) $\frac{1}{4}$ or $-3$
- (D) $-\frac{1}{3}$ or $\frac{4}{3}$
- (E) None of the above

Question: 54

A playground is in the shape of a trapezoid, with the longer parallel side twice as long as the shorter side and the height equal to the length of the shorter side. If the area of the playground is 66,150 m$^2$, find the length of the shorter parallel side.

- (A) 250 m
- (B) 290 m
- (C) 300 m
- (D) 210 m
- (E) None of the above

Question: 55
A football team snaps the ball from their 10 yard line. The quarterback throws to a receiver who lined up 20 yards to the right of the quarterback and ran straight downfield. If the pass was 25 yards, how far downfield was the receiver when he caught the ball?

(A) 15 yards  
(B) 5 yards  
(C) \(5\sqrt{41}\)  
(D) \(10\sqrt{2}\)  
(E) None of the above

**Question: 56**

After his final exam, a student goes to the top of a building and throws his book into the air. The height \(h\) in feet of the book above the ground is given by: 
\[ h = -16t^2 + 32t + 128. \]
How long is the book in the air?

(A) 4 seconds  
(B) 2 seconds  
(C) 8 seconds  
(D) 6 seconds  
(E) None of the above

**Question: 57**

Given the function \(f(x)\) below, find \(x\) when \(f(x) = 100.\)

\[ f(x) = 3.2x^2 - 10.4x - 54 \]

(A) \(-5.5\) or \(8.75\)  
(B) \(5.5\) or \(-8.75\)  
(C) \(0.4554\) or \(-3.705\)  
(D) \(-0.4554\) or \(3.705\)  
(E) None of the above

**Question: 58**

Solve for \(w\).

\[ \sqrt{14 - w} = w + 6 \]

(A) 2 or 11  
(B) \(-2\)  
(C) \(-5\) or \(-10\)  
(D) \(-2\) or \(-11\)  
(E) None of the above

**Question: 59**
Solve for $x$.  
$\sqrt{2x + 5} = \sqrt{2x - 3} + 2$  
(A) $\frac{3}{2}$ or $-\frac{5}{2}$  
(B) 2  
(C) -1  
(D) 6  
(E) None of the above

**Question: 60**

Solve for $x$.  
$x = \left(17x^2 - 16\right)^{\frac{1}{4}}$  
(A) 4 or 1  
(B) 4, -4, 1, or -1  
(C) 16 or 1  
(D) 2, -2, 1, or -1  
(E) None of the above

**Question: 61**

Solve for $x$.  
$3x - 4 < 8x + 5$  
(A) $(-\infty, -\frac{9}{5})$  
(B) $\left(-\infty, -\frac{9}{5}\right]$  
(C) $\left(-\frac{9}{5}, -\infty\right)$  
(D) $\left[-\frac{9}{5}, \infty\right)$  
(E) None of the above

**Question: 62**

Express the solution of the compound inequality in interval notation.  
$-2 \leq x$ and $-2 \geq x$  
(A) $(-\infty, \infty)$  
(B) $\emptyset$  
(C) $[-2]$  
(D) $[-2, 2]$  
(E) None of the above

**Question: 63**

Solve for $x$.  
$8 \geq \frac{4 - 5x}{-2} \geq 2$  
(A) $[-16, -4]$  
(B) $\left[\frac{8}{5}, 4\right]$  
(C) $\left(-\infty, \frac{8}{5}\right] \cup [4, \infty)$  
(D) $\emptyset$ (empty set)  
(E) None of the above
Question: 64

A business can rent a photocopy machine and pay either $80/week rental plus $0.02 per copy or $35/week and $0.05 per copy.

Up to what number of photocopies can be made so that the second option will be the equivalent or better choice?

(A) 1500 copies  
(B) 1833 copies  
(C) 3833 copies  
(D) 1600 copies  
(E) None of the above

Question: 65

Solve.

\[3y^2 - 26y < 77\]

(A) \(\left( -\infty, -\frac{7}{3} \right) \cup \{11, \infty\}\)  
(B) \(\left[0, \frac{26}{3}\right]\)  
(C) \(\left[-\frac{7}{3}, 11\right]\)  
(D) \(\left[\frac{7}{3}, 11\right]\)  
(E) None of the above

Question: 66

Solve for \(p\).

\[2p^2 - p - 15 \geq 0\]

(A) \(\left[ -\frac{5}{2}, 3 \right]\)  
(B) \(\left(-\infty, -3\right] \cup \left[\frac{5}{2}, \infty\right)\)  
(C) \([-5, 3]\)  
(D) \(\left(-\infty, -\frac{5}{2}\right] \cup [3, \infty)\)  
(E) None of the above

Question: 67

Solve for \(x\).

\[\frac{x + 1}{x - 3} \leq 0\]

(A) \((-\infty, -1] \cup (3, \infty)\)  
(B) \([-1, \infty)\)  
(C) \([-1, 3]\)  
(D) \([-1, 3]\)  
(E) None of the above
Question: 68

Solve for $x$.
\[
\frac{x^2 - 10x + 24}{x + 3} \leq 0
\]
(A) $(-\infty, -3] \cup [4, 6]$
(B) $[4, 6]$
(C) $(-\infty, 6]$
(D) $(-\infty, -3) \cup [4, 6]$
(E) None of the above

Question: 69

Find the domain.
\[
y = \sqrt{\frac{y - 6}{y + 12}}
\]
(A) $(-\infty, -12) \cup [6, \infty)$
(B) $(-\infty, -12] \cup [6, \infty)$
(C) $(-12, 6]$
(D) $[-6, 12]$
(E) None of the above

Question: 70

Match the graph with the absolute value inequality.

$|x| \neq 1$

(A)

(B)

(C)

(D)

Question: 71

Solve for $z$:
\[
\left| \frac{4}{z - 1} \right| = 2
\]
(A) $\frac{5}{2}$ or $-\frac{5}{2}$
(B) $1$ or $-3$
(C) $2$ or $-2$
(D) $3$ or $-1$
(E) None of the above

Question: 72
Find the midpoint of the segment whose endpoints are \( A \left( -\frac{1}{3}, \frac{1}{2} \right) \) and \( B \left( \frac{1}{6}, -\frac{2}{3} \right) \).

(A) \( \left( \frac{-2}{3}, 1 \right) \)
(B) \( \left( -\frac{1}{6}, -\frac{1}{6} \right) \)
(C) \( \left( -\frac{1}{12}, -\frac{1}{12} \right) \)
(D) \( \left( -\frac{3}{12}, \frac{7}{12} \right) \)
(E) None of the above

**Question: 73**

Find the equation of the circle in which the endpoints of a diameter are \( A(0,0) \) and \( B(4,6) \).

(A) \( x^2 + y^2 = 52 \)
(B) \( (x - 4)^2 + (y - 6)^2 = 52 \)
(C) \( (x - 2)^2 + (y - 3)^2 = 13 \)
(D) \( (x - 2)^2 + (y - 3)^2 = 5 \)
(E) None of the above

**Question: 74**

Find the standard equation of the circle with radius 3 and center at \((-4,2)\).

(A) \( (x - 4)^2 + (y - 2)^2 = 9 \)
(B) \( (x + 4) + (y - 2) = 3 \)
(C) \( (x + 4)^2 + (y - 2)^2 = 9 \)
(D) \( (x - 4)^2 + (y + 2)^2 = 9 \)
(E) None of the above
Question: 75

Choose the graph of \( y = 3x^2 - 6x \).

(A) 

(B) 

(C) 

(D) 

(E) None of the above

Question: 76
From the graph given, identify the $x$-intercept.

(A) $(0, -3)$
(B) $(-3, 0)$
(C) $(1, 0)$
(D) $(0, 1)$
(E) None of the above

**Question: 77**

At what values of $x$, if any, does the following graph fail the vertical line test for functions?

(A) $-2 \leq x \leq 2$
(B) $0 \leq x \leq 2$
(C) $-2 \leq x \leq 0$
(D) The graph represents a function.

**Question: 78**
Use the vertical line test to determine which of the following graphs is a function.

Question: 79
Find the range of the given function, 
\[ y = 10 + 40 \left( 2^{-0.1x} \right), \text{ where } x \geq 0. \]

- **(A)** \( y > 0 \)
- **(B)** \( y \geq 0 \)
- **(C)** \( -\infty < y < \infty \)
- **(D)** \( 10 < y \leq 50 \)
- **(E)** None of the above

**Question: 80**

Given the function 
\[ f(x) = \sqrt{x + 5}, \]
find its domain.

- **(A)** \( \mathbb{R} \)
- **(B)** \( x \geq -5 \)
- **(C)** \( x \leq -5 \)
- **(D)** \( -5 \leq x \leq -5 \)
- **(E)** None of the above

**Question: 81**

Given \( y = 2(3^x) \), find the interval for \( x \) where \( f(x) \) is decreasing.

- **(A)** \((-5, 0)\)
- **(B)** \((-\infty, \infty)\)
- **(C)** \((0, \infty)\)
- **(D)** None
- **(E)** None of the above

**Question: 82**
Find the slope of the line through the two points \((-2, 4)\) and \((1, 4)\).

(A) \(-\frac{1}{8}\)
(B) \(-8\)
(C) 0
(D) Undefined
(E) None of the above

Question: 83

Artificial Technology was studied for the last 12 months and its stock price is plotted on the graph. Describe the slope of the line.

(A) Positive
(B) Negative
(C) Undefined
(D) 0
(E) None of the above

Question: 84
Find the slope and $y$-intercept of the line described by $y = -\frac{3}{4}x - 1$.

- (A) $m = -\frac{3}{4}$ and $b = -1$
- (B) $m = -\frac{3}{4}$ and $b = 1$
- (C) $m = -1$ and $b = -\frac{3}{4}$
- (D) $m = -3$ and $b = 4$
- (E) None of the above

**Question: 85**

A given line has a slope $\frac{-2}{3}$ and passes through the point $(3,4)$. Find the equation of the line.

- (A) $y - 4 = -\frac{2}{3}(x - 3)$
- (B) $y + 4 = -\frac{2}{3}(x - 3)$
- (C) $y = -\frac{2}{3}(x - 3) - 4$
- (D) $y = -\frac{2}{3}(x + 3) + 4$
- (E) None of the above

**Question: 86**

Given the graph, find the matching equation.

- (A) $y = \frac{1}{2}x - 4$
- (B) $y = 2x - 4$
- (C) $y = 2x + 2$
- (D) $y = \frac{1}{2}x + 2$

**Question: 87**
Question: 88

How would you alter the function \( f(x) = x^2 \) so that the parabola moves up 2 units, to the left 5 units, and is 3 times wider?

(A) \( f(x) = 3(x+2)^2 - 5 \)
(B) \( f(x) = -\frac{1}{3}(x+5)^2 + 2 \)
(C) \( f(x) = \frac{1}{3}(x+5)^2 + 2 \)
(D) \( f(x) = -3(x+5)^2 + 2 \)
(E) None of the above

Question: 89

Write the equation for the parabola whose graph is shown below.

(A) \( y = 2(x+1)^2 + 3 \)
(B) \( y = 2(x+1)^2 - 3 \)
(C) \( y = 2(x+3)^2 - 1 \)
(D) \( y = 2(x-3)^2 - 1 \)
(E) None of the above

Question: 90

In which direction does the graph of \( y = -3x^2 \) open?

(A) Up
(B) Down
(C) Left
(D) Right

Question: 91
Graph: \[ f(x) = -3x^2 - 6x - 5 \]

Question: 92
What can you conclude about equation of the following parabola?

(A) The discriminant is zero.
(B) The discriminant is negative.
(C) The value of $a$ is 0.
(D) The constant is 0.
(E) None of the above

Question: 93

In a baseball game, a batter pops a ball straight up in the air and the height of the ball is given by the function $f(t) = -16t^2 + 128t$, where $t$ is the elapsed time in seconds. A seagull then plucks the ball out of the air and swallows it. If the ball never reached its maximum height, and the seagull had an altitude of 192 feet when it swallowed the ball, find the time when the seagull ate the ball.

(A) 1
(B) 2
(C) 3
(D) 4
(E) None of the above

Question: 94

QID: 9822

Given $y = x^2 - 2x + 3$, complete the square and convert the equation to $y = a(x-h)^2 + k$.

(A) $y = (x + 1)^2 + 4$
(B) $y = (x - 1)^2 + 4$
(C) $y = (x - 1)^2 + 2$
(D) $y = (x + 1)^2 + 2$
(E) None of the above

Question: 95

Which function rises to the right, $u(x) = \left(\frac{1}{2}\right)^x$ or $v(x) = 2^x$?

(A) $u(x) = \left(\frac{1}{2}\right)^x$
(B) Neither
(C) Both
(D) $v(x) = 2^x$

Question: 96
If 800 euros are placed into a 3% savings account, how many euros will be in the account after 5 years if interest is compounded quarterly?

Use the formula \( A = P \left(1 + \frac{r}{m}\right)^{mt} \).

Question: 97

A banker can lend money at 9.1% compounded monthly or at 9.3% compounded quarterly. If the length of the loan is 15 years, which type of loan profits the banker more?

(A) The 9.1% loan is more profitable.
(B) The 9.3% loan is more profitable.

Question: 98

If the inflation rate averages 3 percent over the next 8 years, the expected cost of services for any year in that time frame is given by \( C(x) = Kn \cdot 1.03^x \), where \( K \) is the present cost. If the cost of a haircut is presently $10.95, find the expected cost 8 years from now.

(A) $11.05
(B) $13.87
(C) $90.23
(D) $10.99
(E) None of the above

Question: 99

Evaluate \( \log_9 81 \)

(A) 9
(B) 1
(C) \( \frac{1}{2} \)
(D) \( -9 \)
(E) None of the above

Question: 100

Which of these two functions, \( f(x) = \log_1 \frac{x}{2} \) or \( g(x) = \log_2 x \), increases as \( x \) increases?

(A) Both increase
(B) Neither increases
(C) \( f(x) \)
(D) \( g(x) \)

Question: 101
Solve.
\[x = \log_5 \frac{1}{25}\]
(A) 2
(B) \(\frac{1}{5}\)
(C) \(-2\)
(D) \(\sqrt[5]{0.04}\)
(E) None of the above

Question: 102

Expand: \(\log_e \sqrt{\frac{km}{p}}\)
(A) \(\log_e \sqrt{k}m - \log_e p\)
(B) \(\frac{1}{2} \log_e k + \frac{1}{2} \log_e m - \frac{1}{2} \log_e p\)
(C) \(\frac{\log_e \sqrt{km}}{\log_e p}\)
(D) \(2(\log_e k + \log_e m - \log_e p)\)
(E) None of the above

Question: 103

Fully expand the following logarithm and simplify if possible.
\(\log_2 8xy\)
(A) \(3 \log_2 x + 3 \log_2 y\)
(B) \(3 + \log_2 x + \log_2 y\)
(C) \(3 \log_2 x \log_2 y\)
(D) \(3 + \log_2 x \log_2 y\)
(E) None of the above

Question: 104

Solve for \(x\).
\[2^{9-2x} = \frac{1}{32}\]
(A) 8.984
(B) 175.5
(C) 7
(D) 4.492
(E) None of the above

Question: 105
In an amplifier, the power gain, $P$ is given by the function
$$P = 10 \log \frac{P_{\text{OUT}}}{P_{\text{IN}}}$$
where $P_{\text{IN}}$ and $P_{\text{OUT}}$ are the power input and output in watts. If an amplifier has a power gain of 22 watts and the output power was 15 watts, find the power input in watts.

**Question: 106**

The voltage across a resistor in a circuit is given by the function
$$V(t) = V_0 \left(1 - e^{-\frac{t}{5}}\right),$$
where $t$ is the time in seconds and $V_0$ is the initial voltage at $t = 0$. How long does it take for the voltage across the resistor to drop to one-half of its original value?

(A) .15 seconds
(B) .69 seconds
(C) .89 seconds
(D) .92 seconds

**Question: 107**

Find the lengths of the major and minor axes of the ellipse represented by this equation.
$$\frac{(x + 2)^2}{15} + \frac{y^2}{64} = 1$$

(A) Major axis = 32, minor axis = 7.5
(B) Major axis = 64, minor axis = 15
(C) Major axis = 8, minor axis = $\sqrt{15}$
(D) Major axis = 16, minor axis = $2\sqrt{15}$
(E) None of the above

**Question: 108**

Write the equation for the ellipse that passes through the point $(1, 5)$ with center at the origin and a horizontal axis of length 4.

(A) $\frac{x^2}{4} + \frac{y^2}{100} = 1$
(B) $\frac{x^2}{2} + \frac{y^2}{100} = 1$
(C) $\frac{x^2}{100} + \frac{y^2}{4} = 1$
(D) $\frac{x^2}{4} + \frac{y^2}{100} = 1$
(E) None of the above
Question: 109

A hyperbola's vertices are located at \((-3, 0)\) and \((3, 0)\), and its asymptotes are \(y = \pm \frac{2}{3}x\). Write the equation for the hyperbola.

(A) \(\frac{y^2}{9} - \frac{x^2}{4} = 1\)

(B) \(\frac{x^2}{9} - \frac{y^2}{4} = 1\)

(C) \(\frac{x^2}{4} - \frac{y^2}{9} = 1\)

(D) \(\frac{y^2}{4} - \frac{x^2}{9} = 1\)

(E) None of the above

Question: 110

Write the equation of the hyperbola with foci at \((2, 5)\) and \((-4, 5)\) where the transverse axis has a length of 4.

(A) \(\frac{(x - 2)^2}{4} - \frac{(y - 5)^2}{5} = 1\)

(B) \(\frac{(x + 1)^2}{4} - \frac{(y - 5)^2}{5} = 1\)

(C) \(\frac{(y - 5)^2}{4} - \frac{(x + 1)^2}{5} = 1\)

(D) \(\frac{(x - 1)^2}{4} - \frac{(y + 5)^2}{5} = 1\)

Question: 111

Determine the domain for the function.

\(f(x) = 3x^2 - 3\)

(A) 1

(B) -1

(C) all real numbers except \(x = 1\)

(D) \(\mathbb{R}\)

(E) None of the above

Question: 112
Find the logarithmic form of:

\[ 2^{-5} = \frac{1}{32} \]

(A) \( \log_2 \frac{1}{32} = 5 \)
(B) \( \log_2 \frac{1}{32} = 2 \)
(C) \( \log_2 5 = \frac{1}{32} \)
(D) \( \log_2 \frac{1}{32} = -5 \)
(E) None of the above

**Question: 113**

If you want to invest $2,500 and have it grow to be $3,000 in two years, what rate of interest rounded to the nearest tenth of a percent is necessary if your investment is compounding continuously?

(A) 9.1%
(B) 18.2%
(C) 22%
(D) 6.2%
(E) None of the above

**Question: 114**

The Oval Office of the President of the United States is in the shape of an ellipse. The room is 36 feet long (horizontal distance) by 28 feet wide (vertical distance). Write the equation for this ellipse.

(A) \( \frac{x^2}{1296} + \frac{y^2}{784} = 1 \)
(B) \( \frac{x^2}{324} + \frac{y^2}{196} = 1 \)
(C) \( \frac{x^2}{324} + \frac{y^2}{784} = 1 \)
(D) \( \frac{x^2}{198} + \frac{y^2}{1296} = 1 \)
(E) None of the above

**Question: 115**

What are the coordinates of a point located in the fourth quadrant and 3 units away from each axis?

(A) (3, 3)
(B) (−3, −3)
(C) (−3, 3)
(D) (3, −3)
(E) None of the above

**Question: 116**
The distance between two points can be found ________.

(A) Using an averaging formula  
(B) Using a formula derived from the Pythagorean Theorem.  
(C) By finding the length of a parallel line.  
(D) By dividing by the negative inverse of the length of a perpendicular line.

**Question: 117**

Any point \((x, y)\) that is the square root of the distance away from the point \((h, k)\) is on the circle whose radius is \(r\).

(A) true  
(B) false

**Question: 118**

Expand.  
\((2x + 2)^3\)

(A) \(8x^3 + 24x^2 + 24x + 8\)  
(B) \(2x^3 + 8x^2 + 8x + 8\)  
(C) \(4x^3 + 12x^2 + 12x + 4\)  
(D) \(4x^2 + 4x + 4\)  
(E) None of the above

**Question: 119**

Factor the following trinomial:  
\(5x^2 + 29x − 6\).

(A) \((5x + 6)(x − 1)\)  
(B) \((5x + 1)(x − 6)\)  
(C) \((5x − 1)(x + 6)\)  
(D) \((5x − 2)(x + 3)\)  
(E) None of the above

**Question: 120**

Solve for \(k\).  
\(32^k = 16\)

(A) \(k = 1/2\)  
(B) \(k = 2\)  
(C) \(k = 4/5\)  
(D) \(k = 5/4\)  
(E) None of the above

**Question: 121**
Match the correct graph to the function.

\[ f(x) = \log_5(4x) \]
Question: 122
What condition must be met for an equation to called a function?
(A) There must be, at most, one y value, or output, for any given x value, or input.
(B) There must be exactly two y values, or outputs, for any given x value, or input.
(C) Two or more x values, or inputs, must yield different y values, or outputs.
(D) A vertical line intersects the graph of the equation at more than one point.

Question: 123
The distance r to a star is measured in parsecs, but astronomers like to use the Distance Modulus M given by the formula \( M = 5 \log_r r - 5 \). If a star is 52 parsecs away, what is its distance modulus?
Round your answer to the nearest hundredth.
(A) -16.42
(B) 3.58
(C) 7.53
(D) 8.58
(E) None of the above

Question: 124
The function \( y = 2x^2 + x + 3 \) has a maximum value.
(A) true
(B) false

Question: 125
Use the change of base formula to approximate the value of
\( \log_8 \left( \frac{4162}{4.89} \right) \).
(A) 2.9300
(B) 3.2444
(C) 1.0300
(D) -3.2444
(E) None of the above

Question: 126
Solve the system by the elimination method.
\[ 6x - 9y = 7 \]
\[ -4x + 6y = 10 \]
(A) An infinite number of solutions
(B) (0, 5)
(C) \( \left( \frac{5}{6}, \frac{5}{2} \right) \)
(D) No solution
(E) None of the above
Question: 127
What is the value of the piecewise function $f(x) = \begin{cases} x^2 + 2 & \text{for } x \leq 3 \\ 3x + 2 & \text{for } x > 3 \end{cases}$ when $x = 1$?

(A) 2
(B) 3
(C) 3
(D) 1
(E) None of the above

Question: 128
Is the following function odd, even, both or neither?

$y = x^2 + \frac{3}{2}$

(A) odd
(B) even
(C) both odd and even
(D) neither odd nor even

Question: 129
Simplify.

$-2^4$

(A) 16
(B) 8
(C) -8
(D) -16
(E) None of the above

Question: 130
Simplify.

$(-3 - 2i)^2$

(A) $-5 - 12i$
(B) $-11 + 2i$
(C) $5 + 12i$
(D) $11 - 2i$
(E) None of the above

Question: 131
Simplify.

$18 + 13i - (13 + 6i)$

(A) $36 + 19i$
(B) $7i$
(C) $-7i$
(D) $-36 - 19i$
(E) None of the above

Question: 132
Given \( f(x) = |2x - 6| \), find the value of \( f(2) - f(1) \).

\[
\begin{array}{ll}
\text{(A)} & -1 \\
\text{(B)} & 6 \\
\text{(C)} & -2 \\
\text{(D)} & 2 \\
\text{(E)} & \text{None of the above}
\end{array}
\]

Question: 133

Express as a single log:

\[ 8 \log_a \left( \frac{4}{x} \right) - \log_a (x-1)^4 + \log_a 4 \]

\[
\begin{array}{ll}
\text{(A)} & 8 \log_a \left( \frac{\sqrt{x-1}}{x} \right) \\
\text{(B)} & \log_a 4x(x-1)^4 \\
\text{(C)} & \log_a \frac{x(x-1)^4}{4} \\
\text{(D)} & \log_a \frac{4(x-1)^8}{x} \\
\text{(E)} & \text{None of the above}
\end{array}
\]

Question: 134
Graph the line that passes through the point \((-1, 0)\) with slope \(-3\).
Question: 135

If two lines are parallel and the equation of one line is \(-2x + y = 0\), does the other line increase or decrease from left to right?

(A) Increase
(B) Decrease
(C) The line is horizontal.
(D) The line is vertical.
(E) None of the above

Question: 136

Solve:
\[ |5x - 2| = |8x + 6| \]

(A) \( x = \frac{8}{3}, x = \frac{4}{13} \)
(B) \( x = -\frac{8}{3}, x = -\frac{4}{13} \)
(C) \( x = \frac{3}{8}, x = \frac{13}{4} \)
(D) \( x = -\frac{3}{8}, x = -\frac{13}{4} \)
(E) None of the above

Question: 137

Solve.
\[ |x + 2| < 4 \]

(A) \( x \leq -6 \) or \( x \geq 2 \)
(B) \( -6 < x < 2 \)
(C) \( -6 \leq x \leq 2 \)
(D) \( x < -6 \) or \( x > 2 \)
(E) None of the above

Question: 138

Which describes the nature of the roots of the equation?
\[ 5x^2 + 6x + 2 = 0 \]

(A) two unequal imaginary roots
(B) two unequal real roots
(C) one real root and one imaginary root
(D) one real root
(E) None of the above

Question: 139
Doug’s average driving speed is 5 kilometers per hour faster than Gracie’s. In the same length of time it takes Doug to drive 415 kilometers, Gracie drives only 390 kilometers. What is Doug’s average speed?

(A) 88 km/hr
(B) 83 km/hr
(C) 78 km/hr
(D) 73 km/hr
(E) None of the above

Question: 140

Solve.

\[|2-(x-7)|\leq14\]

(A) \(x \leq -5 \text{ or } x \geq 23\)
(B) \(x \leq 5 \text{ or } x \leq 23\)
(C) \(x \geq 9 \text{ or } x \geq 5\)
(D) \(x \geq 5 \text{ or } x \leq -9\)
(E) None of the above

Question: 141

Add the following polynomials:

\[4x^2-(13x+15)+[-(12x^3-9x^2)-5x]\]

(A) \(10x^3+7x\)
(B) \(-12x^3-5x^2-18x-15\)
(C) \(-12x^3+13x^2-18x-15\)
(D) \(x^2-18x-15\)

Question: 142

Find the product.

\((x-4)(x^2+2x+4)\)

(A) \(x^3-2x^2-8x-16\)
(B) \(x^2+x-16\)
(C) \(x^3-2x^2-4x-16\)
(D) \(x^3+2x^2-16\)
(E) None of the above

Question: 143
Identify the greatest common factor of the terms of the expression.

\[35xy^2 + 280x^2y^2 - 40x^3y^3\]

(A) $5xy^2$
(B) $5$
(C) $5x$
(D) $5y^2$
(E) None of the above

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<th>Question: 144</th>
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Factor the polynomial.

\[3x^2 - 18xy - 18y + 3x\]

(A) $3(x + 6y)(x - 1)$
(B) $3(x - 6y)$
(C) $3(x - 6y)(x + 1)(x + 3y)$
(D) $3(x - 6y)(x + 1)$
(E) None of the above

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<th>Question: 145</th>
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</table>
Which of the following is the graph of \((x - 2)^2 + (y + 1)^2 = 16\)?
Question: 146

Given the equation
\[ x^2 - 14x + y^2 - 14y + 49 = 0, \]
complete the square for both \( x \) and \( y \) and find the equation of the circle.

(A) \((x + 7)^2 + (y - 7)^2 = 49\)
(B) \((x + 7)^2 + (y + 7)^2 = 49\)
(C) \((x - 7)^2 + (y + 7)^2 = 49\)
(D) \((x - 7)^2 + (y - 7)^2 = 49\)
(E) None of the above

Question: 147

Describe the transformation of \( f(x) = x^2 \) that occurs in the function.
\[ g(x) = (x + 3)^2 + 7 \]

(A) 5 units to the right and 7 units down
(B) 5 units to the left and 7 units up
(C) 5 units to the left and 7 units down
(D) 5 units to the right and 7 units up
(E) None of the above

Question: 148

Beginning with the graph of the function
\[ y = -2(x - 3)^2 + 1, \]
which of the following shows the changes you would make to the function so that the vertex lies at \((3, 5)\) and the parabola becomes 4 times more compressed and it opens in a positive direction?

(A) \(y = -8(x + 3)^2 + 5\)
(B) \(x = \frac{1}{2}(y - 3)^2 + 5\)
(C) \(y = \frac{1}{2}(x - 3)^2\)
(D) \(y = 8(x - 3)^2 + 5\)
(E) None of the above

Question: 149

Given that a function is reflected across the \( x \)-axis and we know the points \((1, -3)\), \((-8, 4)\), and \((4, -6)\) are on the curve, what points must lie on the reflection?

(A) \((-1, -3), (8, 4), (-4, -6)\)
(B) \((-1, 3), (8, -4), (-4, 6)\)
(C) \((1, 3), (-8, -4), (4, 6)\)
(D) \((1, -3), (8, -4), (4, -6)\)

Question: 150
A parabola \( y = 9x^2 \) reflected over the \( x \)-axis would have the equation:

(A) \( x^2 = -9y \)
(B) \( y = \frac{1}{9}x^2 \)
(C) \( y = -9x^2 \)
(D) \( y = -\frac{1}{9}x^2 \)

**Question: 151**

Which of the following is not an exponential function?

(A) \( f(x) = \pi^{\pi x} \)
(B) \( f(x) = \frac{14^x-13}{5} \)
(C) \( f(x) = 3^{4x+5} \)
(D) \( f(x) = \sqrt[7]{9x} \)
(E) None of the above

**Question: 152**

Evaluate:

\[ \log_7 343 \]

(A) 3
(B) 4
(C) \( \frac{1}{7} \)
(D) \( \frac{2}{7} \)
(E) None of the above

**Question: 153**

Use a calculator to evaluate.

\[ \ln 0.68093 \]

(A) −0.384296
(B) −0.619
(C) 0.619
(D) 0.384
(E) None of the above

**Question: 154**

Solve for \( x \).

\[ \log_2(x + 4) - \log_2(x + 2) = \log_2 3 \]

(A) 1
(B) −5
(C) −1
(D) 2
(E) None of the above
Question: 155

Solve for $\alpha$:

$$\log(\log \alpha) = 0.7$$

(A) 102771.4
(B) 6.59
(C) 2.01
(D) No solution
(E) None of the above

Question: 156

Solve this system of equations by the substitution method:

$$\begin{align*}
3x - 2y &= -17 \\
-3x + y &= 13
\end{align*}$$

(A) $(-3, 4)$
(B) $(-2, 19)$
(C) $\left(4, \frac{29}{2}\right)$
(D) No solution
(E) None of the above

Question: 157

Solve by completing the square.

$$3x^2 + 8x - 5 = 0$$

(A) $-3 \pm \sqrt{11}$
(B) $-1 \pm \sqrt{7}$
(C) $-2, \frac{1}{2}$
(D) $-4 \pm \sqrt{31}$
(E) None of the above

Question: 158

A coffee house blended 12 pounds of espresso flavored coffee beans with 11 pounds of vanilla flavored coffee beans. The 23 pound mixture cost $166.50. A second mixture included 17 pounds of espresso flavored coffee beans and 18 pounds of vanilla flavored coffee beans. The 35 pound mixture cost $254. Find the cost per pound of the espresso and vanilla flavored coffee beans.

(A) espresso: $8; vanilla: $6
(B) espresso: $7; vanilla: $7.50
(C) espresso: $6; vanilla: $8
(D) espresso: $7.50; vanilla: $7
(E) None of the above

Question: 159
Determine the vertices, asymptotes, and foci of the hyperbola.

\[
\frac{y^2}{64} - \frac{x^2}{16} = 1
\]

(A) vertices: \((0, \pm 8)\), foci: \((0, \pm 4\sqrt{5})\).

asymptotes: \(y = \pm \frac{1}{2}x\)

(B) vertices: \((\pm 8, 0)\), foci: \((\pm 4\sqrt{5}, 0)\).

asymptotes: \(y = \pm \frac{1}{2}x\)

(C) vertices: \((0, \pm 8)\), foci: \((0, \pm 4\sqrt{5})\).

asymptotes: \(y = \pm 2x\)

(D) vertices: \((0, \pm 4)\), foci: \((\pm 4\sqrt{5}, 0)\).

asymptotes: \(y = \pm 2x\)

(E) None of the above
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