MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Linear

1) The temperature in a room is changing at a steady rate. If \( x \) is the number of minutes since noon, the temperature was \(-4^\circ\) C when \( x = -3 \) minutes and the temperature was \( 6^\circ \) C when \( x = -5 \) minutes. Find the rate of change in temperature in degrees per minute.

A) 10  
B) 5  
C) -5  
D) 2

2) Sketch the line with slope \( \frac{3}{2} \) that passes through the point (4, 2)

A)  
B)  
C)  
D)

3) The charge for renting a car is $26 per day plus an initial fee of $15. Write a formula for the cost of renting a car for \( x \) days.

A) \( y = x + 15 \)  
B) \( y = x + 26 \)  
C) \( y = 15x + 26 \)  
D) \( y = 26x + 15 \)
4) A water tank is emptying steadily by 2 liters of water per hour. There were 2 liters of water 6 hours after midnight. Let \( x \) represent the number of hours since midnight, and let \( y \) represent the number of liters of water in the tank. Find the equation showing the amount of water at time \( x \).

A) \( y = -2x - 10 \)  
B) \( y = -2x + 8 \)  
C) \( y = 2x - 4 \)  
D) \( y = -2x + 14 \)

5) Find an equation of the line through \((2, -5)\) and \((5, -23)\)

A) \( y = -6x + 7 \)  
B) \( y = -6x - 5 \)  
C) \( y = -\frac{1}{6}x - \frac{14}{3} \)  
D) \( y = 6x - 17 \)

6) Find the equation of the line perpendicular to \( y = \frac{2}{5}x + 2 \), passing through \((8, -6)\)

A) \( y = -\frac{2}{5}x + 16 \)  
B) \( y = \frac{5}{2}x - 14 \)  
C) \( y = -10x + 19 \)  
D) \( y = -\frac{5}{2}x + 14 \)

7) The graphs shows the elevation \( y \) in feet of a hot air balloon \( x \) minutes after noon. Write an equation for the graph in slope-intercept form.

\[
\begin{align*}
A) \quad y &= -\frac{3}{2}x - 3 \\
B) \quad y &= -\frac{3}{2}x - 2 \\
C) \quad y &= -\frac{2}{3}x - 2 \\
D) \quad y &= \frac{2}{3}x - 2
\end{align*}
\]

8) The equation below gives the number of acres of rain-forest left in the world, where \( y \) is in millions of square kilometers, and \( x \) is the number of years since 1950.

\[100y + 8x = 1160\]

What does the \( y \)-intercept of the graph tell you?

A) In 8 years, there will be 100 million square kilometers of rain-forest left.
B) The rain-forest is shrinking by 8 million square kilometers per year.
C) In 1950, there were 11.6 million square kilometers of rain forest.
D) It will take 11.6 years for the rain forest to deplete.
9) The equation below gives the number of acres of rain-forest left in the world, where y is in millions of square kilometers, and x is the number of years since 1950.

\[100y + 8x = 1160\]

What does the x-intercept of the graph tell you?
A) It will take 145 years for the rain forest to deplete.
B) There are 145 million square kilometers of rain-forest left.
C) The rain-forest is shrinking by 8 million square kilometers per year.
D) In 8 years, there will be 100 million square kilometers of rain-forest left.

10) Which table could be described by a linear equation?

A) \[
\begin{array}{c|cccc}
  x & -2 & 0 & 2 \\
  y & 4 & 0 & 4 
\end{array}
\]

B) \[
\begin{array}{c|cccc}
  x & 0 & 2 & 5 \\
  y & 4 & 6 & 8 
\end{array}
\]

C) \[
\begin{array}{c|cccc}
  x & 1 & 2 & 3 \\
  y & 4 & 7 & 10 
\end{array}
\]

D) \[
\begin{array}{c|cccc}
  x & 2 & 3 & 4 \\
  y & 4 & 9 & 16 
\end{array}
\]

11) A person is driving a car along a straight road. The graph shows the distance y in miles that the driver is from home after x hours. The graph passes through the point (2, 100). What is the meaning of this point?

A) It will take the driver 2 hours to complete the trip, which requires driving 100 additional miles.
B) The driver has driven for 2 hours and must drive an additional 100 miles to complete the trip.
C) After 2 hours the driver is 100 miles from home.
D) After 100 hours, the driver is 2 miles from home.

12) The graph shows the number of gallons of water in a swimming pool after x hours. There is a pump that can either add or remove water from the pool. Find the slope of the line, and interpret the slope as a rate of change.

A) The pump adds water at a rate of 100 gallons per hour for two hours.
B) The pump adds 600 gallons of water.
C) The pump adds water for 300 hours
D) The pump adds water at a rate of 300 gallons per hour.
13) In 1912, the glacier on Mount Kilimanjaro in Africa covered 5 acres. By 2002, this glacier melted to only 1 acre. Assuming this glacier melted at a constant rate each year, write a linear equation that gives the acres, y, of this glacier x years after 1912.

A) \( y = 5x + 1 \)  \hspace{1cm} B) \( y = -22.5x + 1912 \)  \hspace{1cm} C) \( y = -\frac{2}{45}x + 5 \)  \hspace{1cm} D) \( y = .04x - 5 \)

Solve.
14) \(-2x + 7(2x - 6) = -24 - 6x\)
A) \(-\frac{11}{3}\)  \hspace{1cm} B) 1  \hspace{1cm} C) -11  \hspace{1cm} D) -1

Solve the equation.
15) \(-3(k + 2) - (-4k - 4) = 5\)
A) 3  \hspace{1cm} B) 7  \hspace{1cm} C) -7  \hspace{1cm} D) 1

16) Decide if the given value for the variable is a solution to the inequality (Y/N).
\( 3z - 7 < 6z - (4z + 5); \ z = 1 \)
A) Yes  \hspace{1cm} B) No

17) Solve the inequality: \( 20x - 36 > 4(4x - 8) \)
A) \( x < 1 \)  \hspace{1cm} B) \( x > 1 \)  \hspace{1cm} C) \( x > 20 \)  \hspace{1cm} D) \( x < 20 \)

18) Solve the inequality: \( -2a - 19 > -3 \)
A) \( a < -8 \)  \hspace{1cm} B) \( a > -8 \)  \hspace{1cm} C) \( a \geq -8 \)  \hspace{1cm} D) \( a < -8 \)

Shade the solution.
19) \( 5x + y \leq 3 \)
A)  

```latex
\begin{array}{cccc}
\text{A)} & \text{B)} & \text{C)} & \text{D)} \\
\end{array}
```

B)  

```latex
\begin{array}{cccc}
\text{A)} & \text{B)} & \text{C)} & \text{D)} \\
\end{array}
```
20) What is the x-value of the solution to the system?
\[-7x + 5y = 5\]
\[5x + 3y = 3\]
A) x=2  B) x=-1  C) x=0  D) No solutions

21) What is the x-value of the solution to the system?
\[x - y + 5z = -4\]
\[2x + z = 0\]
\[x + 5y + z = 20\]
A) x=1  B) x=0  C) x=4  D) No solution

22) What is the x-value of the solution to the system?
\[x + y + z = -1\]
\[x - y + 4z = -11\]
\[4x + y + z = 11\]
A) x=-1  B) x=-4  C) x=4  D) No solution

23) When 75% of a number is added to 6, the result is 3 more than the number. Write the equation that models this problem.
A) 0.75x + 6 = x + 3  B) 0.75 + 6 = x + 3  C) 0.75 + x + 6 = x + 3  D) 0.75x = 6 + 3x

Write a system of linear equations that models the situation.
24) 6 boxes of chocolate-covered almonds and 5 soft drinks cost $28, 7 boxes of chocolate-covered almonds and 3 soft drinks cost $27. Let x be the price of a box of chocolate-covered almonds and y be the price of a soft drink.
A) 5x + 6y = 28  B) 6x + 3y = 28  C) 6x + 5y = 28  D) 6x + 7y = 28
7x + 3y = 27  5x + 7y = 27  7x + 3y = 27  5x + 3y = 27

Write a system of linear equations that models the situation.
25) There were 510 people at a play. The admission price was $3 for adults and $1 for children. The admission receipts were $1210. Let x be the number of adults that attended the play and y be the number of children who attended the play.
A) y = 510 - x  B) 1210 - y = 510  C) x + y = 1210  D) x + y = 510
x + y = 1210  3x = 1210  3x + y = 510  3x + y = 1210

26) A certain aircraft can fly 1280 miles with the wind in 5 hours and travel the same distance against the wind in 8 hours. Let x be the speed of the plane in still air and y be the speed of the wind.
A) 5x = 1280  B) x + y = 1280  C) 5x + 5y = 1280  D) 5x + 8y = 1280
8x = 1280  8x = 5y  8x - 8y = 1280  5x = 8y

27) Mardi received an inheritance of $50,000. She invested part at 7% and deposited the remainder in tax-free bonds at 8%. Her total annual income from the investments was $3700. Find the amount invested at 7%.
A) $15,000  B) $30,000  C) $46,300  D) $29,000

28) How much pure acid (100% acid solution) should be mixed with 6 gallons of a 50% acid solution in order to get an 80% acid solution?
A) 15 gal  B) 24 gal  C) 9 gal  D) 3 gal
29) Linda and Dave leave simultaneously from the same starting point biking in opposite directions. Linda bikes at 6 miles per hour and Dave bikes at 9 miles per hour. How long will it be until they are 25 miles apart from each other?

A) \( \frac{25}{34} \) hrs  
B) \( \frac{2}{3} \) hrs  
C) \( \frac{3}{5} \) hrs  
D) \( 8\frac{1}{3} \) hrs

30) A basketball fieldhouse seats 15000. Courtside seats sell for $9, endzone for $6, and balcony for $5. The game is a sell-out if it makes $89,000 in ticket sales. There are 7000 more seats in balcony than in courtside. Write a system of equations that models this situation where \( x \) is the number of courtside seats in the fieldhouse, \( y \) is the number of endzone seats in the fieldhouse, and \( z \) is the number of balcony seats in the fieldhouse.

A) \( x + y + z = 15000 \)  
\( 9x + 6y + 5z = 89000 \)  
\( z = 7000 + x \) 

B) \( x + y + z = 89000 \)  
\( 9x + 6y + 5z = 15000 \)  
\( z = 7000 + x \) 

C) \( x + y + z = 15000 \)  
\( 9x + 6y + 5z = 89000 \)  
\( x + 7000 + z \) 

D) \( x + y + z = 15000 \)  
\( x + y + z = 89000 \)  
\( x + z = 7000 \) 

Quadratics

31) Solve the equation: \( 11m^2 - 14m = 0 \)

A) \( -\frac{14}{11}, \frac{14}{11} \)  
B) \( 0, \frac{14}{11} \)  
C) \( 0 \)  
D) \( -\frac{14}{11}, 0 \)

32) Which of the following is a step in the solution of \( x^2 - 12x - 8 = 0 \) by completing the square?

A) \( 3x^2 - 12x + 36 = -8 + 36 \)  
B) \( (x - 6)^2 = 8 + 36 \)  
C) \( (x - 6)^2 = 8 \)  
D) \( (x - 2)^2 = 8 + 12 \)

33) Solve for \( r \): \( A = Pr^2 \)

A) \( r = \frac{\pm \sqrt{A} - 1}{P} \)  
B) \( r = \pm \frac{\sqrt{A}}{P} - 1 \)  
C) \( r = \frac{\pm \sqrt{A}}{P} - 1 \)  
D) \( r = \frac{\pm \sqrt{A}}{P} - 1 \)

34) Use the quadratic formula to solve the equation. \( 2x^2 + 8x + 3 = 0 \)

A) \( \frac{4 - \sqrt{10}}{2}, \frac{-4 + \sqrt{10}}{2} \)  
B) \( \frac{-8 - \sqrt{10}}{2}, \frac{-8 + \sqrt{10}}{2} \)  
C) \( \frac{-4 - \sqrt{10}}{4}, \frac{-4 + \sqrt{10}}{4} \)  
D) \( \frac{-4 - \sqrt{22}}{2}, \frac{-4 + \sqrt{22}}{2} \)

35) A window washer accidentally drops a bucket from the top of a 256-foot building. The height \( h \) of the bucket after \( t \) seconds is given by \( h = -16t^2 + 256 \). When will the bucket hit the ground?

A) 16 sec  
B) 64 sec  
C) 4 sec  
D) -4 sec

36) Find the vertex of the parabola. \( f(x) = x^2 - 10x + 32 \)

A) (5, 32)  
B) (0, 32)  
C) (5, 7)  
D) (0, 7)
37) Find an equation for the parabola with vertex \((-3, -5)\) and intercept \((0, 13)\).
   
   A) \(y = -3x^2 - 5x + 13\)  
   B) \(y = 2x^2 + 12x + 13\)  
   C) \(y = x^2 - 3x + 13\)  
   D) \(y = (x+3)^2 - 5\)

38) A hotel finds that its revenue is given by \(R = 8000 + 760x - 30x^2\) when it charges \(80 + 10x\) dollars for a room. To the nearest dollar, what is the maximum revenue it can earn?
   
   A) $9,920  
   B) $13,530  
   C) $12,813  
   D) no maximum

39) Solve the inequality: \(x^2 - 4x > 0\)
   
   A) \(x > 4\)  
   B) \(x > 0\) or \(x > 4\)  
   C) \(x < -4\) or \(x > 4\)  
   D) \(x < 0\) or \(x > 4\)

40) Find the equation for the parabola in the graph:

   A) \(y = (x-1)^2\)  
   B) \(y = (x-1)^2 + 1\)  
   C) \(y = (x+1)^2 + 1\)  
   D) \(y = (x+1)^2 - 1\)

41) Find an equation for the parabola:

   A) \(y = -x^2 + 4x + 9\)  
   B) \(y = -x^2 - 4x + 5\)  
   C) \(y = -x^2 + x + 5\)  
   D) \(y = x^2 - 2x + 9\)
Polynomials

42) Subtract: \((-6x^3 + 9x^2 + 4) - (-5x^3 + 2x - 5)\)
   A) \(-11x^3 + 9x^2 + 2x - 1\)
   B) \(-x^3 + 9x^2 + 2x - 1\)
   C) \(-x^3 + 9x^2 - 2x + 9\)
   D) \(-x^6 + 9x^4 - 2x^2 + 9\)

43) Multiply: \((x - 3)(7x^2 + x + 8)\)
   A) \(7x^3 - 22x^2 + 5x - 24\)
   B) \(7x^3 - 20x^2 + 5x - 24\)
   C) \(7x^3 - 20x^2 + 11x - 24\)
   D) \(7x^3 - 20x^2 + 5x - 24\)

44) Factor: \(x^3 - 8y^6\)
   A) \((x - 2y^2)^3\)
   B) \((x - y)(x^2 + 8y^5)\)
   C) \((x - 2y^2)(x^2 + 2xy^2 + 4y^4)\)
   D) \((x - 2y^2)(x^2 + 2xy^2 + 4y^4)\)

Algebraic Fractions

45) Multiply: \(\frac{k^2 + 11k + 18}{k^2 + 13k + 36} \cdot \frac{k^2 + 4k}{k^2 + 9k + 14}\)
   A) \(\frac{k}{k + 7}\)
   B) \(\frac{1}{k + 7}\)
   C) \(\frac{k}{k^2 + 13k + 36}\)
   D) \(\frac{k^2 + 4k}{k + 7}\)

46) Divide: \(\frac{36x^2 - 25}{x^2 - 64} + \frac{6x - 5}{x + 8}\)
   A) \(\frac{6x + 5}{x - 8}\)
   B) \(\frac{x - 8}{6x + 5}\)
   C) \(\frac{(6x - 5)(36x^2 - 25)}{(x^2 + 8)(x + 8)}\)
   D) \(\frac{6x - 5}{x + 8}\)

47) Add. Simplify if possible.
   \(\frac{15}{x^2 + 3x} + \frac{4}{x} + \frac{5}{x + 3}\)
   A) \(\frac{4}{x}\)
   B) \(\frac{9}{x}\)
   C) \(\frac{5}{x}\)
   D) \(\frac{20}{x}\)

48) Subtract. Simplify if possible.
   \(\frac{7}{z^2} - \frac{2}{z}\)
   A) \(\frac{2z - 7}{z}\)
   B) \(\frac{7 - 2z}{z^2}\)
   C) \(\frac{7z + 2}{z^2}\)
   D) \(\frac{7 + 2z}{z^2}\)
49) Solve: \( \frac{5}{x + 5} + \frac{7}{x - 5} = \frac{12}{x^2 - 25} \)

A) \( x = 4\sqrt{3} \)  
B) \( x = 72 \)  
C) \( x = -36 \)  
D) \( x = 36 \)

50) Simplify: \( \frac{5}{x} + 3 \)

A) \( \frac{x}{5x - 3} \)  
B) \( \frac{1}{5x - 3} \)  
C) \( \frac{x}{5 - 3x} \)  
D) \( \frac{1}{5 - 3x} \)

51) \( y \) is directly proportional to \( x \) and \( y = 36 \) when \( x = 6 \). Find the constant of proportionality \( k \).

Then, find \( y \) when \( x = 13 \).

A) \( k = -6; y = -78 \)  
B) \( k = 216; y = \frac{216}{13} \)  
C) \( k = 8; y = 104 \)  
D) \( k = 6; y = 78 \)

52) \( y \) is inversely proportional to \( x \) and \( y = 22.5 \) when \( x = 9 \). Find the constant of proportionality \( k \).

Then, find \( y \) when \( x = 81 \).

A) \( k = 202.5; y = 2.5 \)  
B) \( k = 226.8; y = 2.8 \)  
C) \( k = 2.5; y = 202.5 \)  
D) \( k = 178.2; y = 2.2 \)

53) The amount of force \( F \) in pounds needed to lift a heavy object with a lever varies inversely with the length \( L \) of the lever. It took 100 pounds of force to lift a refrigerator with a 12-foot lever. Which equation models \( F \) as a function of \( L \)?

A) \( F = 8.5L \)  
B) \( F = 1200L \)  
C) \( F = \frac{8.5}{L} \)  
D) \( F = \frac{1200}{L} \)

Rational Exponents and Radicals

54) Simplify the expression. Write with positive exponents.

\( \frac{(2x^{3/2})^2}{x^{1/2}} \)

A) \( 4x^{5/2} \)  
B) \( 2x^3 \)  
C) \( 4x^2 \)  
D) \( 4x^{7/4} \)

55) Simplify and write answer with positive exponents: \( \frac{(2a^{-3})^{-4}}{2a^{-4}} \)

A) \( \frac{-8}{a^{16}} \)  
B) \( \frac{a^8}{8} \)  
C) \( \frac{a^{16}}{32} \)  
D) \( \frac{-4}{a^8} \)

56) Multiply: \( x^{1/4}(2x - x^{1/4}) \)

A) \( 2x^{1/2} - x^{1/8} \)  
B) \( 2x \)  
C) \( \frac{1}{2}x - \frac{1}{4}x^2 \)  
D) \( 2x^{5/4} - x^{1/2} \)
Simplify the expression. Assume that all variables are positive.

57) \(3\sqrt{x^3y^3}\)
A) \(x^6y^2\)  
B) \(x^6y\)  
C) \(x^2y^6\)  
D) \(xy^6\)

58) \(\sqrt{45x^7y^5}\)
A) \(3x^3y^4\sqrt{5x}\)  
B) \(3y^4\sqrt{5x^6}\)  
C) \(3x^7y^8\sqrt{5x}\)  
D) \(3x^3y^4\sqrt{5x}\)

59) Rationalize the denominator: \(\frac{7a}{\sqrt{6}}\)
A) 43  
B) \(\frac{49a\sqrt{6}}{6}\)  
C) \(7a\sqrt{6}\)  
D) \(\frac{7a\sqrt{6}}{6}\)

60) Rationalize the denominator: \(\frac{5}{7 - \sqrt{5}}\)
A) \(\frac{35 + 5\sqrt{5}}{2}\)  
B) \(\frac{35 - 5\sqrt{5}}{44}\)  
C) \(\frac{35 + 5\sqrt{5}}{44}\)  
D) \(\frac{5}{7} - \frac{5}{\sqrt{5}}\)

61) Which graph represents \(f(x) = \sqrt{x - 1}\)
A) 
B) 
C) 
D)
62) Solve the equation. $\sqrt{x + 4} = \sqrt{x + 1}$

A) 2  
B) $\frac{1}{4}$  
C) 3  
D) no solution

63) The length that a spring is stretched beyond its natural position is given by $L = \sqrt{\frac{2W}{k}}$ where work, $W$, is in foot-pounds and $k$ is a constant for the given spring. If a certain spring has a constant of 66.8, and the spring is to be stretched a length of 3.2 feet beyond its natural position, how much work will be necessary?

A) 684 foot-pounds  
B) 106.9 foot-pounds  
C) 342 foot-pounds  
D) 59.7 foot-pounds

64) The length $L$ of a river is related to the area $A$ of its drainage basin by the formula $L = 1.05 A^{0.5}$. The Congo River is 4165 miles long. What is the area of its drainage basin?

A) 2536 sq mi  
B) 6839 sq mi  
C) about $1.6 \times 10^{-7}$ sq mi  
D) about $1.6 \times 10^7$ sq mi

65) Solve: $(x+1)^{\frac{3}{2}} = 27$

A) 8  
B) 26  
C) 728  
D) 9

Functions

66) For the table given is $y$ a function of $x$?

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

A) Function  
B) Not a function

67) Determine whether the graph given represents a function.

A) Function  
B) Not a function
68) Using the graph of f provided below answer the following question. For what value(s) of x is f(x) = 1?

A) -3  B) 1  C) -2, 2  D) -1.6, 1.6

69) Use the graph of f to evaluate f(-3)

A) 0  B) -4  C) 1  D) 2

70) Find f(-4) when f(x) = 3x^2 - 2x - 2
A) 58  B) 54  C) 38  D) 48

71) The number of televisions in the average American home x years after 1994 is given by N(x) = .05x + 1.4. Evaluate N(8) and interpret the result.
A) N(8) = 1.8; there were an average of 1.8 televisions per home in 2002.
B) N(8) = 1.8; there were an average of 1.8 more televisions per home in 2002 than in 1994.
C) N(8) = 2.1; there were an average of 2.1 televisions per home in 2002.
D) N(8) = 1.5; there were an average of 1.5 televisions per home in 2002.

72) The population of Midville, in thousands of people, is given by P(t) = 1.5t + 3, where t is the number of years after 1980. Choose the correct statement.
A) In 1992, the population was 6000.  B) In 1986, the population was 12,000.
C) In 1980, the population was 4500.  D) In 1986, the population was 9,000.
73) Francine received 120 hours of free Internet time in a promotional offer. She spends 1.5 hours per day connected to the Internet. \( H = f(t) \) gives the number of free hours Francine has left after \( t \) days. What does the \( t \)-intercept of the graph tell us?

A) How long Francine spends on the Internet every day.
B) Francine had 120 free hours initially.
C) She will use up the free hours in 80 days.
D) The number of days that have gone by

74) The value, in dollars, of a copy machine is given by the function \( f(x) = -250x + 5000 \), where \( x \) is the number of years that have passed since the machine was purchased. Interpret the slope of the graph of \( f \) as a rate of change.

A) The copy machine was worth $5000 initially
B) The copy machine depreciates entirely in 250 years.
C) The copy machine decreases in value by $20 each year.
D) The copy machine decreases in value by $250 each year.

Exponential

75) Solve the equation: \( 3^{(9 - 3x)} = 27 \)

A) 9  B) \( \frac{1}{2} \)  C) 2  D) -2

76) Find an exponential function that models the data in the table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>5</td>
<td>20</td>
<td>80</td>
<td>320</td>
<td>1280</td>
</tr>
</tbody>
</table>

A) \( f(x) = 5(4)^x \)  B) \( f(x) = 15x + 5 \)  C) \( f(x) = 4(5)^x \)  D) \( f(x) = \frac{1}{15}x + 5 \)

77) Mr. Moneywell’s art collection has been increasing in value by 6% per year. This year it was valued at $20,000. Write an exponential equation for the value \( V \) of the collection \( t \) years from now.

A) \( V = 20000 \left(0.06\right)^t \)  B) \( V = 20000 \left(1.06\right)^t \)  C) \( V = 20000 + 0.06t \)  D) \( V = 20000 \left(0.94\right)^t \)

78) Solve the equation: \( 3^x + 6 = 4 \)

A) \( \log_3 \frac{3}{4} + 6 \)  B) \( \log_3 \frac{3}{4} + 6 \)
C) \( \log_4 \frac{3}{4} - 6 \)  D) \( \log_4 - \log_3 - \log 6 \)

79) Plutonium–238 decays at a rate of 0.8% per year. How much of a 50-gram sample will be left after \( t \) years?

A) \( 50 (0.2)^t \)  B) \( 50 - 0.8t \)  C) \( 50 (0.992)^t \)  D) \( 50 (0.8)^t \)

80) Solve the equation: \( 6500 \left(3\right)^{\frac{t}{12}} = 75,000 \)

A) 5.11  B) 32.16  C) 46.15  D) 26.71
81) Expand the expression. Assume that all variables are positive.
\[ \log_8 \frac{x^4}{\sqrt[8]{yz^8}} \]

A) \( 4 \log_8 x - 4 \log_8 y + 4 \log_8 z \)  
B) \( 4 \log_8 x - \log_8 yz^8 \)

C) \( \frac{8 \log_8 x}{\log_8 y + 8 \log_8 z} \)  
D) \( 4 \log_8 x - \frac{1}{2} \log_8 y - 4 \log_8 z \)

82) Find the center and radius of the circle that has (-2, 5) and (-4, 9) as endpoints of the diameter.

A) Center: (-3, 7) Radius: \( \sqrt{5} \)  
B) Center: (-3,7) Radius: 5

C) Center: (1,-2) Radius: \( \sqrt{58} \)  
D) Center: (-1, 2) Radius: 50

83) Solve the equation: \( \log (5 + x) - \log (x - 4) = \log 2 \)

A) \( \frac{1}{2} \)  
B) -13  
C) 13  
D) No solution

84) Solve the equation: \( \log_9 4 + \log_9 x = 1 \)

A) \( \frac{4}{9} \)  
B) \( 4\sqrt[9]{9} \)  
C) \( \frac{1}{4} \)  
D) \( \frac{9}{4} \)

85) Find out how long it takes a $3200 investment to double if it is invested at 8% compounded semiannually.

Round to the nearest tenth of a year using the formula \( A = P \left(1 + \frac{r}{n}\right)^{nt} \) where \( P \) represents the principal (initial amount), \( r \) represents the annual interest rate as a decimal, \( n \) represents the number of times the interest is compounded per year, \( t \) represents the number of years, and \( A \) represents the amount after time \( t \).

A) 8.6 years  
B) 8.8 years  
C) 9 years  
D) 9.2 years

86) \( f(x) = 33.4 + 1.4 \log (x + 1) \) gives the salinity of ocean water at depth \( x \) meters. Find the salinity (to the nearest hundredth) at a depth of 607 meters.

A) -29.50  
B) 91.58  
C) 94.38  
D) 37.30
87) How long will it take for a population of 4000 to double if its annual growth rate is 7.1%? (Round to the nearest year.)
   A) 1 yr  B) 10 yr  C) 28 yr  D) 4 yr

Conics

88) Find the standard equation of the circle that has a center at (-8, 5) and a radius of $\sqrt{2}$
   A) $(x - 5)^2 + (y + 8)^2 = 4$  B) $(x + 8)^2 + (y - 5)^2 = 2$
   C) $(x + 5)^2 + (y - 8)^2 = 4$  D) $(x - 8)^2 + (y + 5)^2 = 2$

89) Find the center and radius of the circle.
   $x^2 + y^2 + 2y = 8$
   A) (0, 1); 3  B) (0, 2); 2  C) (1, 0); 4  D) (0, -1); 3

Use the graph to determine the equation of the ellipse.

90) A) $7x^2 + 5y^2 = 1$  B) $\frac{x^2}{49} + \frac{y^2}{25} = 1$  C) $49x^2 + 25y^2 = 1$  D) $\frac{x^2}{7} + \frac{y^2}{5} = 1$
91) One of the graphs below is the graph of \( x^2 - y^2 = 1 \). Which one?

A) 

B) 

C) 

D) 

WORKOUT. Write your answer in the space provided or on a separate sheet of paper.

92) The table below shows the amount of water in a tank \( w \), in gallons, after \( t \) minutes.

<table>
<thead>
<tr>
<th>( t ) (minutes)</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>( w ) (gallons)</td>
<td>200</td>
<td>160</td>
<td>120</td>
<td>80</td>
</tr>
</tbody>
</table>

(a) Write a linear equation for the amount of water in the tank, \( w \), in terms of the time \( t \).
(b) State the slope of the equation in part (a). What are the units of the slope? What does the slope mean in the context of this problem?
(c) State the \( w \)-intercept of the equation in part (a). What does the \( w \)-intercept tell us about this situation?
(d) State the \( t \)-intercept of the equation in part (a). What does the \( t \)-intercept tell us about this situation?

93) A submarine is steadily descending. After 2 minutes it is at an elevation of \(-15\) meters, and after 5 minutes it is at an elevation of \(-30\) meters. Let \( y \) be the submarine’s elevation after \( x \) minutes:

(a) Find the slope (include units) of \( y \) in terms of \( x \). Explain what the slope tells us about the submarine.
(b) Find the equation of \( y \) in terms of \( x \).
(c) Sketch a graph.
(d) \((3, -20)\) is a point on the graph. What does this point tell us about the submarine?

94) A certain population of crickets triples every day. If the population started with 20 crickets, how many crickets will there be after \( t \) days?

(a) Write an exponential equation for the population, \( P \), of crickets after \( t \) days.
(b) What will the population be after 5 days?
(c) When will the population of crickets reach 200,000? Round to the nearest tenth.

95) Mrs. Powell’s art collection has been increasing in value by 8% per year. This year it was valued at $10,000.

(a) Write an exponential equation for the value \( V \) of the collection \( t \) years from now.
(b) What will the collection be worth 10 years from now?
(c) When will the collection double in value?
(d) How long will it take the value to double again?
96) Suppose \( F(x) = \frac{2 - \log(100 - x)}{0.40} \) represents the number of years that it takes for \( x \) percent of a population of 603 web-footed sparrows to die.

(a) Find \( F(90) \). Explain what \( F(90) \) means in the context of this problem. Write your answer in a complete sentence.

(b) Approximate the percentage (to the nearest whole per cent) of web-footed sparrows that died after 4 years.

97) A student takes out two loans totaling $13,000 to help pay for college expenses. One loan is at 8% simple interest, and the other is at 9% simple interest. The first-year interest is $1110.

(a) Write a system of equations in two variables to find the amount of the 8% loan and 9% loan stating what your variables represent.

(b) Solve the system found in part (a)

(c) Find the amount of each loan and write your answer in complete sentence.

98) A cruise boat travels 72 miles downstream in 4 hours and returns upstream in 6 hours.

(a) Write a system of equations in two variables to find the rate of the current and speed of the boat in still water. State what your variables represent.

(b) Solve the system found in part (a)

(c) What is the rate of the current?
Answer Key
Testname: MET SAMPLE FALL 2012 MATH 125

1) C
2) D
3) D
4) D
5) A
6) D
7) C
8) C
9) A
10) C
11) C
12) D
13) C
14) B
15) B
16) A
17) B
18) D
19) D
20) C
21) B
22) C
23) A
24) C
25) D
26) C
27) B
28) C
29) B
30) A
31) B
32) B
33) B
34) A
35) C
36) C
37) B
38) C
39) D
40) C
41) B
42) C
43) B
44) D
45) A
46) A
47) B
48) B
49) C
50) C
51) D
52) A
53) D
54) A
55) C
56) D
57) B
58) D
59) D
60) C
61) D
62) B
63) C
64) D
65) A
66) A
67) B
68) C
69) D
70) B
71) A
72) B
73) C
74) D
75) C
76) A
77) B
78) C
79) C
80) D
81) D
82) A
83) C
84) D
85) B
86) D
87) B
88) B
89) D
90) B
91) C
92) (a) \( w = -10t + 240 \)
  
  (b) \(-10\) gallons per minute. It tells us that the amount of water in the tank is decreasing by 10 gallons every minute.
  
  (c) \((0, 240)\). It tells us that originally the tank held 240 gallons of water.
  
  (d) \((24, 0)\). It tells us that after 24 minutes the tank will be empty.
93) (a) -5 meters per minute. It tells us that the submarine is decending 5 meters every minute.
   (b) \( y = -5x - 5 \)
   (c) 
   (d) The point tells us that after 3 minutes the submarine has descended to an elevation of -20 meters.

94) (a) \( P = 20(3)^t \)
    (b) 4860 crickets
    (c) After about 8.4 days

95) (a) \( V = 20000(1.06)^t \)
    (b) About $35,817
    (c) About 12 years
    (c) About 24 years

96) (a) \( F(90) = 2.5 \). It takes two and a half years for 90% of a population of 603 web-footed sparrows to die.
    (b) About 97%

97) (a) \( x + y = 13000 \)
    \( 0.08x + 0.09y = 1110 \)
    (b) (6000, 7000)
    (c) The student borrowed $6000 at the 8% rate and borrowed $7000 at the 9% rate.

98) (a) \( 4x + 4y = 72 \)
    \( 6x - 6y = 72 \)
    (b) (15, 3)
    (c) 3 mph