# MasterMath

**Algebra Final Exam**

**Closed Book; 90 minutes to complete**
**CUCC; You may use a calculator.**

1. Translate the verbal phrase into an algebraic equation:
   The difference between 12 and the product of x and 3 is 24

   | 12 - 3x = 24 |
   | --- |

2. You can run the mile in 6.5 minutes, which is 45 seconds faster than your friend Fred can run the mile. Write an equation that you could use to determine the time it takes for Fred to run a mile (f).

   | f = 6.5 + .75 |
   | --- |

3. Evaluate this expression for x = 3.5

   | 32 |
   | --- |

   2(4x + 2)

4. Write an Equation or an Inequality to describe this situation:
   The Product of 3 and a number 6 more than x is at most 27

   | 3(x + 6) ≤ 27 |
   | --- |

5. Graph this Inequality:          x > -4

   

6. Create an input-output table for this function: y = 2x + 4.
   Use a domain of -3, -1, 1, 3

   | x | y |
   | --- | --- |
   | -3 | -2 |
   | -1 | 2 |
   | 1 | 6 |
   | 3 | 10 |

7. From this set of numbers, which is not a rational number:
   3, -8, √4, √2, .32665

   | √2 |
   | --- |

8. Five skin divers each attempt to reach a deep reef in the Florida Keys. Their depths in feet below sea level were as follows: -28, -37, -18, -45, -62. What was the mean depth reached?

   | -38 |
   | --- |

9. Are these Equivalent Expressions?
   y = 7x - 22          -3(6 - 2x) - 4 + x = y

   | yes |
   | --- |

**10.** The temperature was pretty cold last week in Deluth. Based upon this table, what was the mean minimum temperature?

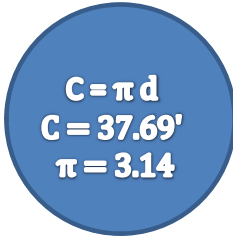| Number of Days | 1 | 3 | 3 |
|---|---|---|---|
| Minimum Temperature | -3 | -9 | 2 |

-3.43

**11.**

You have quarters and dimes that total $2.55. The number of dimes is 8 more than the number of quarters. Write an equation that will allow you to determine both the number of dimes and the number of quarters.

| Equation | dimes | quarters |
|---|---|---|
| 2.55 = .1(q+8)+.25q | 13.0 | 5 |

**12.** Solve for d

12

$$C = \pi d$$
$$C = 37.69'$$
$$\pi = 3.14$$

**13.** A point is 3 units to the right of the origin, and 11 units down from the origin. What are the coordinates of the point?
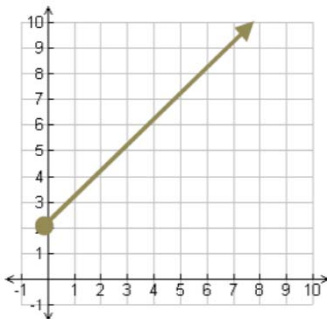
(3, -11)

**14.** Does point (3, 3) fall on the line for the equation y = 3x - 6?

yes

**15.** The coordinates of Point A are (-4, -6). If Point A is translated 3 units up, what are it's new coordinates?

(-4, -3)

**16.** What is the domain and range of the function graphed below?

| domain | x ≥ 0 |
|---|---|
| range | y ≥ 2 |

**17.** Joe had a summer job that pays $7.00 an hour and he worked between 15 and 35 hours every week. His weekly salary can be modeled by the equation: S = 7h, where S is his weekly salary and h is the number of hours he worked in a week. Last week he worked 22.66 hours. Answer the questions below:

| Domain | 15 ≤ x ≤ 35 |
|---|---|
| Range | 105 ≤ x ≤ 245 |
| Continuous or Discrete | continuous |

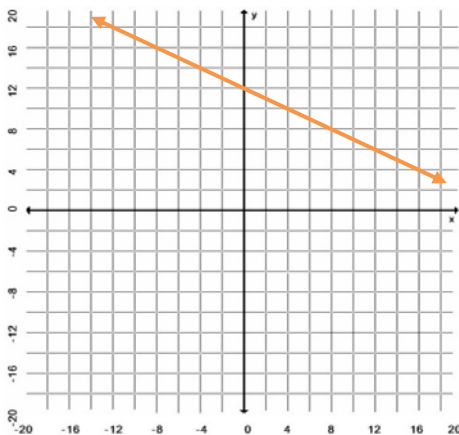**18.** Find the x and y intercepts and use them to graph this equation: 2x - 3y = 6
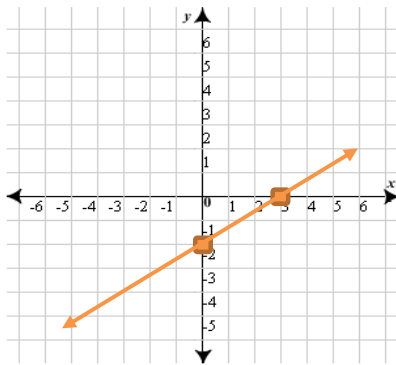


| x Intercept | (3, 0) |
|---|---|
| y intercept | (0, -2) |

**19.** What is the slope of a line that passes through these two points:

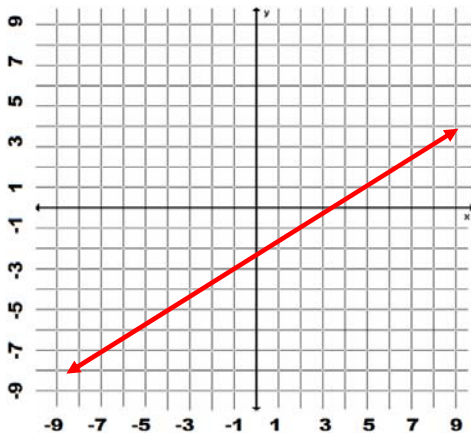(3, 5) and (-2, 10)

| -1 |
|---|

**20.** What is the equation in Slope-Intercept Form for the line graphed here?



| y = -2x + 12 |
|---|

**21.** Does this line represent Direct Variation. Explain your answer.



| No. A Direct Variation includes the Origin, point (0, 0). |
|---|

**22.** Create an equation in Function Form that describes the relationship between x and y shown here. Is it a Direct Variation?

| x | -2 | -1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| y | -8 | -4 | 0 | 4 | 8 |

| f(x) = 4x |
|---|
| yes |

**23.**

Find the equation in Slope-Intercept Form for a line that includes these points: (6, 4) and (0, 2).
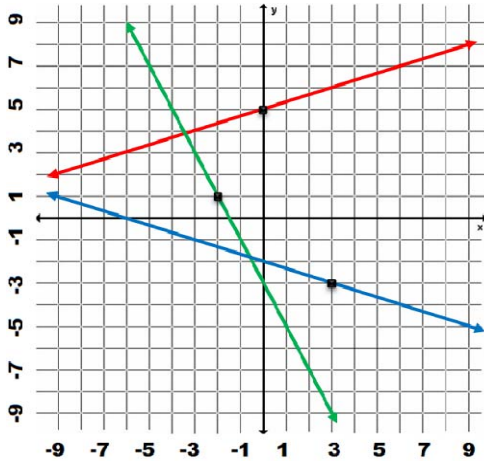
| y = 1/3x + 2 |
|---|

**24.**

A line has a slope of -6 and includes the point (-2, 8). What is the equation for this relationship?

| y = -6x - 4 |

**25.**

A linear function $f$ includes these values: $f(5) = 10$; $f(0) = -10$. Write an equation for this function.

| f(x) = 4x - 10 |



**26.** What is the equation of the red line above in Point-Slope Form? Use the point marked on the line.

| y - 5 = 1/3x |

**27.** What is the equation of the blue line in Standard Form?

| ⅓x + y = -2 |

**28.** What is the equation of the green line above in Point-Slope Form? Use the point marked on the line.

| y - 1 = -2(x + 2) |

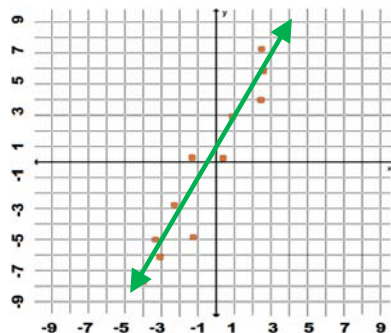**29.** Are these lines parallel or perpendicular: 6x - 2y = -6; x + 3y = 9

| Perpendicular |

**30.** Find the slope of a line that is perpendicular to a line that passes through the points (3, 7) and (-2, -3).

| -1/2 |

**31.** The green line best-fits the data plotted on this graph. If we were to use this line to predict the value of y when x = 25, what type of prediction would this be?

| Extrapolation |

**32.** Solve and graph this inequality: $(-2)(x + 3) \leq 14$

<div style="border:1px solid black; display:inline-block; padding:4px;">x ≥ -10</div>



**33.** Translate into an Inequality, and then graph: All real numbers that are less than 8 and greater than -12.

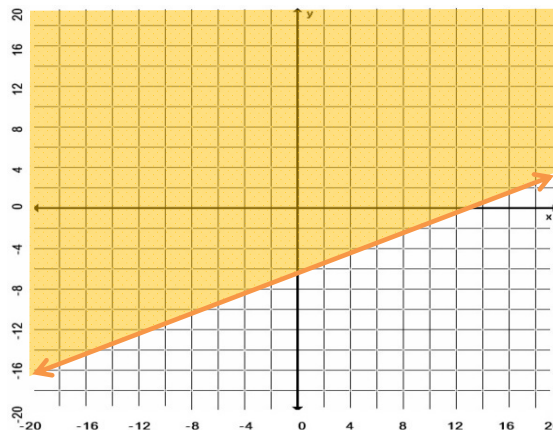<div style="border:1px solid black; display:inline-block; padding:4px;">-12 < x < 8</div>



**34.** The average monthly temperature in a northern Canadian city is 1 degree Fahrenheit. The actual January temperature for that city (t = actual temperature) is never more than 5 degrees Fahrenheit warmer or colder. Solve $|t - 1| \leq 5$ to find the range of temperatures. Graph the solution.

<div style="border:1px solid black; display:inline-block; padding:4px;">-4 ≤ t ≤ 6</div>
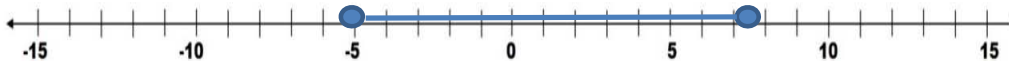


**35.** Graph this Inequality: $2y - x \geq -12$



**36.**

I have six coins in my pocket. They are all either pennies of nickels. The change in my pocket totals 18¢. How many pennies and how many nickels do I have?

Hint: let x = number of nickels and y = number of pennies.

|  | Equation 1 | Equation 2 | nickels |
|---|---|---|---|
| Any form | x + y = 6 | 5x + y = 18 | 3 |
| Slope-Intercept form | y = -x + 6 | y = -5x + 18 | pennies |
|  |  |  | 3 |

**37.** Solve using substitution: 2x - 8y = 4 and -2x + y = 17

<div style="border:1px solid black; display:inline-block; padding:4px;">(-10, -3)</div>

**38.** Solve using Addition or Subtraction: 2x – 2y = -16 and x – 2y = -7

<div style="border:1px solid black; display:inline-block; padding:4px;">(-9, -1)</div>

**39.** Is (3, 1) a solution to this system of equations?

$x + 2y = 4$        $15x + 18y = 14$
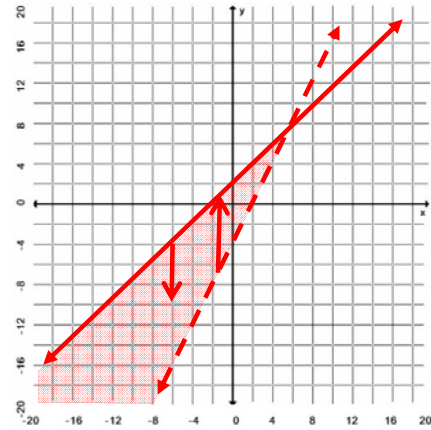
<div style="border:1px solid black; display:inline-block; padding:4px;">no</div>

**40.** Graph these Inequalities and shade in the solution:

$y > 2x - 4$

$y \le x + 2$

**41.** Simplify these expressions

| Expression | Simplified |
|---|---|
| g4 * g3 | g7 |
| $(a^2)^3$ | $a^6$ |
| $a^2 * a^3$ | $a^5$ |
| $x^3 * (x^4)^2$ | $x^{11}$ |
| $x^3 * x^5$ | $x^8$ |
| $(2y^3)^2$ | $4y^6$ |
| $(3x^3) \div (3x)$ | $x^2$ |

**42.** Simplify if necessary, and then rewrite each number to fill in the blank:

| longhand | Scientific Notation |
|---|---|
| .0000000000042 | $4.2 \times 10^{-12}$ |
| 265,300,000,000,000 | $2.653 \times 10^{14}$ |
| 800 * 465,000,000 | $3.72 \times 10^{11}$ |

**43.** Simplify these expressions:

| Expression | Simplified |
|---|---|
| $9^{-1/2}$ | 1/3 |
| $66 - 64^{1/3}$ | 62 |

**44.** A mouse population is 25,000 and is decreasing in size at a rate of 20% per year. What is the mouse population after 3 years?
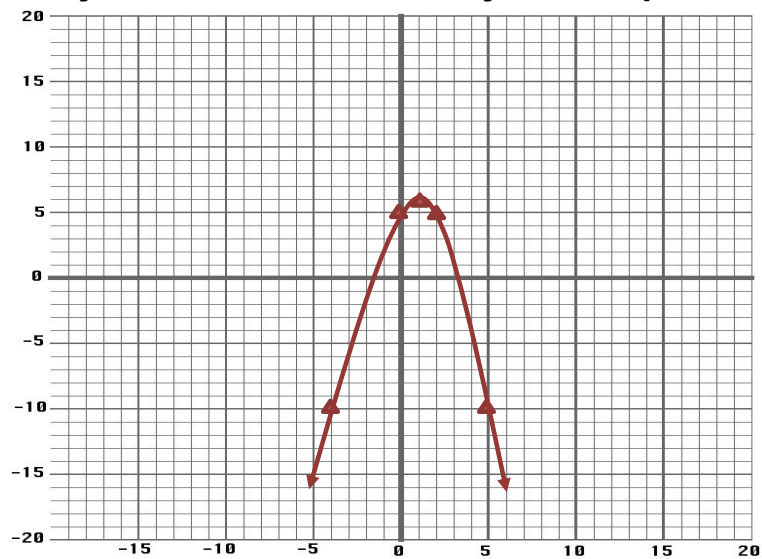
| Equation |
|---|
| $y = 25{,}000 * .8^x$ |
| **Number of Mice** |
| 12,800 |

**45.**

| Find the product of these binomials | | |
|---|---|---|
| (3x + 4) | (3x + 4) | $9x^2 + 24x + 16$ |
| (3x + 4) | (3x - 4) | $9x^2 - 16$ |
| (3x - 4) | (3x - 4) | $9x^2 - 24x + 16$ |
| (z - 5) | (z - 5) | $z^2 - 10z + 25$ |
| (z - 6) | (z + 6) | $z^2 - 36$ |

**46.** Factor these polynomials completely:

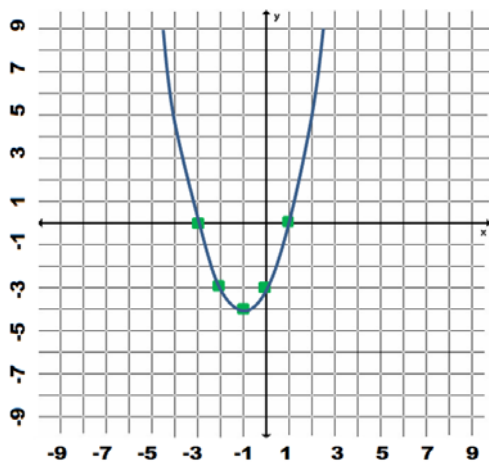| Polynomial | Factor | Factor | Factor |
|---|---|---|---|
| $3x^5 + 3x^4 - 90x^3$ | $3x^3$ | x + 6 | x - 5 |
| $3z^5 - 48z^3$ | $3z^3$ | z + 4 | z - 4 |
| $12k - 3k^3$ | 3k | 2 + k | 2 - k |
| $80x^8 - 45x^6$ | $5x^6$ | 4x+ 3 | 4x - 3 |
| $s^4 - s^2$ | $s^2$ | s + 1 | s - 1 |
| $7a^3b^3 - 63ab^3$ | 7ab | ab - 3b | ab + 3b |
| $75c^9 - 3c^7$ | $3c^7$ | 5c + 1 | 5c - 1 |

**47.**

Please graph this equation: $y = -x^2 + 2x + 5$. Use x = 5 for your fourth point.



**48.** Solve by graphing: $x^2 + 2x = 3$

x = 1 or -3

**49.** Solve these equations:

| Equation | x = | |
|---|---|---|
| $3x^2 - 3 = 0$ | ±1 | |
| $2x^2 - 42 = 8$ | ±5 | |
| $\frac{1}{2}(x - 8)^2 = 3$ | 10.45 | 5.55 |
| $5(x - 2)^2 = 70$ | 5.74 | -1.74 |

**50.** Solve for x. If necessary, round your answers to the nearest hundredth.
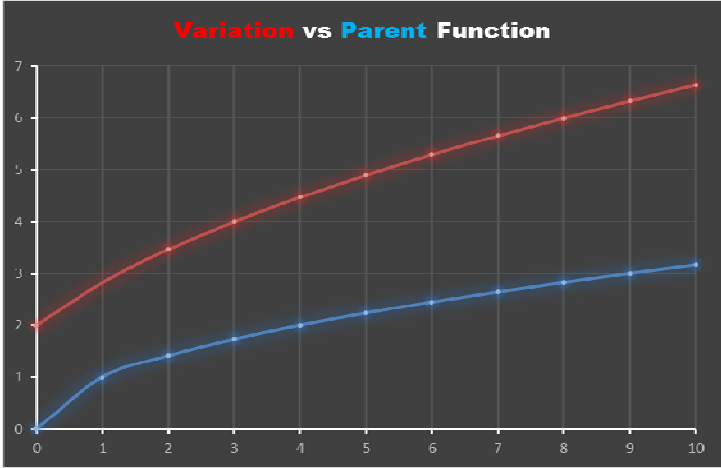
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

| Equation | x = | x = |
|---|---|---|
| $x^2 + 3x - 12 = 0$ | 2.27 | -5.28 |
| $3x^2 + 12 = 5x$ | no solutions | |
| $4x - 2x^2 + 6 = 0$ | -1.00 | 3.00 |
| $x^2 + 5x - 5 = 0$ | .85 | -5.85 |

**51.** This data describes what type of function: linear, exponential, or quadratic?

exponential

| x | y |
|---|---|
| -2 | 1.25 |
| -1 | 2.5 |
| 0 | 5 |
| 1 | 10 |
| 2 | 20 |
| 3 | 40 |

**52.** Graph The Parent Square Root Function and $y = 2\sqrt{(x + 1)}$.



Variation vs Parent Function

**53.** Simplify these Expressions

| Expression | Simplified |
|---|---|
| $\sqrt{(60y^2)}$ | $2y\sqrt{15}$ |
| $\sqrt{(126r^2)}$ | $3r\sqrt{14}$ |
| $(2\sqrt{15})/(\sqrt{12})$ | $\sqrt{5}$ |

**54.** Find x



14.9"

x

11"
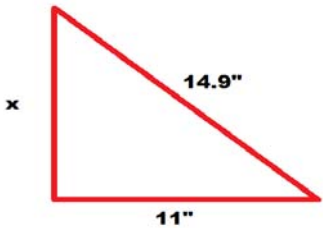
10"

**55.**

points:

If necessary, round your answers to the nearest 100th.

| Point 1 | Point 2 | Distance |
|---------|---------|----------|
| (3, 4) | (5, 6) | 2.83 |
| (-1, 3) | (5, 2) | 6.08 |

**56.**

Find the midpoint of the line between these points:

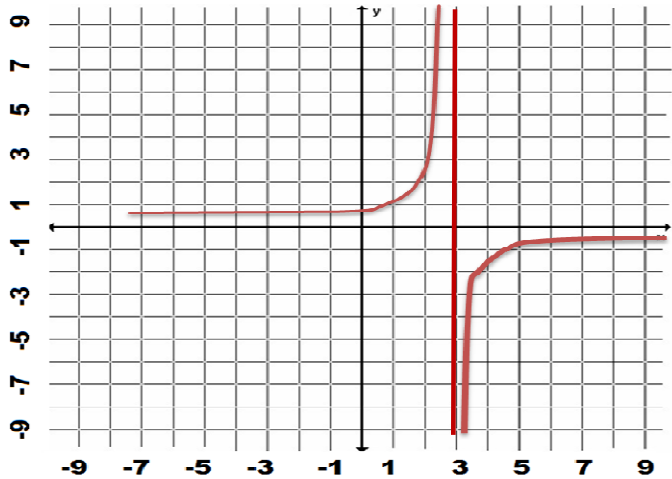| Point 1 | Point 2 | Midpoint |
|---------|---------|----------|
| (3, 4) | (5, 6) | (4, 5) |
| (-1, 3) | (5, 2) | (2, 2.5) |

**57.** Graph the function:

$$y = \frac{-2}{x - 2}$$

Be sure to draw the Asymptotes

| x | y |
|-----|--------|
| 0.0 | 1.0 |
| 1.0 | 2.0 |
| 1.5 | 4.0 |
| 2.0 | #DIV/0! |
| 3.0 | -2.0 |
| 4.0 | -1.0 |
| 5.0 | -0.7 |



**58.** Use Synthetic Division to find the quotient:

$(2x^3 - 4x - 8) \div (x - 2)$

| 2 | | 2 | 0 | -4 | -8 |
|---|---|---|---|----|----|
|   |   |   | 4 | 8 | 8 |
|   |   | 2 | 4 | 4 | 0 |

$2x^2 + 4x + 4$