

Math I Midterm Study Guide (Spring 2019)

1.) Janie and Michael are playing a game. Janie's piece lands at the point $(-4, -7)$. On the next turn, Maya's piece lands at the point $(16, -13)$.

What are the coordinates of the point midway between the two pieces?

A. $(6, -10)$ B. $(-10, 6)$
 C. $(-3, 5)$ D. $(-5, 3)$

$$\frac{-4+16}{2}, \frac{-7+(-13)}{2}$$

$$\frac{12}{2}, \frac{-20}{2}$$

$$6, -10$$

2.) Y is the midpoint of XZ. If the coordinates of X are $(-7, 5)$ and the coordinates of Y are $(-11, 9)$, find the coordinates of Z.

3.) Clara created a coordinate grid of her city. The bowling alley is located at $(6, 10)$ and the movies is located at $(12, -2)$. Halfway between the bowling alley and the movies is the ice cream shop. Clara's house is halfway between the ice cream shop and the movies. What are the coordinates of Clara's house?

A. $(9, 4)$ B. $(4.5, 2)$
 C. $(10.5, 1)$ D. $(7.5, 7)$

4.) Quadrilateral BCDE has vertices $B(-1, -1)$, $C(6, -2)$, $D(5, -9)$, $E(-2, -8)$. Which statement describes quadrilateral BCDE?

~~A. Quadrilateral BCDE is a rectangle.~~
 B. Quadrilateral BCDE is a parallelogram.
 C. Quadrilateral BCDE is a rhombus but not a square.
 D. Quadrilateral BCDE is a square.

\hookrightarrow perp. slopes

5.) What is the area of a rectangle with vertices $A(-5, 8)$, $B(-2, 14)$, $C(12, 7)$, $D(9, 1)$?

$AB = \text{length} = \sqrt{45}$
 $BC = \text{width} = \sqrt{245}$
 $A = LW$
 $= (\sqrt{45})(\sqrt{245}) = 105 \text{ units}^2$

6.) Which equation represents a line perpendicular to the graph of $y = \frac{1}{4}x + 8$?

A. $y = -\frac{1}{4}x - 2$ B. $y = 4x + 7$
 C. $y = -4x + 6$ D. $y = \frac{1}{4}x - 3$

7.) Write the equation that represents the line that is perpendicular to the graph of $4x + 3y = 9$ and passes through $(-2, 3)$?

A. $3x - 4y = -18$
 B. $3x + 4y = 18$
 C. $3x - 4y = -6$
 D. $3x + 4y = 6$

$$\frac{3y = -4x + 9}{3} \Rightarrow y = \frac{-4}{3}x + 3$$

$$3x - 4y = -6$$

$$-4y = -3x - 6$$

$$y = \frac{3}{4}x - \frac{3}{2}$$

8.) Which situation can be best modeled with an exponential function?

A. A taxi charges an initial fee of \$2.00, and \$1.50 for an additional mile.
 B. The population in a town decreased by 15% each year.
 C. An airplane flying at an altitude of 33,000 feet descends at a rate of 20 feet per minute.
 D. A pizza restaurant charges \$5.50 per pizza, and \$0.50 for each additional topping.

9.) Which table of values represents an exponential function?

x	y
1	5
2	10
3	15
4	20
5	25

x	y
1	5
2	20
3	45
4	80
5	125

x	y
1	5
2	25
3	125
4	625
5	3,125

x	y
1	6
2	11
3	16
4	21
5	26

10.) Suppose an African country is seeing its number of species increase at a rate of 3.2% per year. If the current species count is 2,300 species, which equation represents the species population after x years?

A. $y = 2300(1.32)^x$

B. $y = 2300(1.032)^x$

C. $y = 2300(0.32)^x$

D. $y = 0.32(2300)^{x\%}$

11.) Kathy plans to purchase a car that depreciates at a rate of 12% per year. The initial value of the car is \$21,000. Which equation models the value of the car after x years?

A. $y = 21000(1.12)^x$

B. $y = 21000(.88)^x$

C. $y = 21000(0.12)^x$

D. $y = 21000(1.88)^x$

12.) Simplify the expression:

$$(x^3yz^2)(xy^2y^4)$$

$$x^{3+1} y^{1+2} z^{2+4}$$

$$x^4 y^3 z^6$$

13.) Which expression is equivalent to $(2x^2y)^3(3x^2y^3)$?

A. $24x^8y^6$

B. $24x^{12}y^9$

C. $18x^{16}y^9$

D. $18x^{10}y^6$

$$8x^6y^3 \cdot 3x^2y^3$$

$$24x^8y^6$$

14.) Simplify the expression below.

$$(8xy)^{-2} \left(\frac{x^{-5}y^{-1}}{xy} \right) \rightarrow x^{-6}y^{-2}$$

A. $\frac{1}{64x^8y^4}$

B. $\frac{x^9y}{64}$

C. $2x^2$

D. $\frac{1}{8x^5}$

$$\frac{1}{64x^8y^4} \cdot \frac{1}{x^6y^2}$$

15.) A square has a side length of $3x + 5$. Which expression is equivalent to the area of the square minus the perimeter of the square?

A. $9x^2 + 18x + 5$

B. $9x^2 + 18x + 45$

C. $9x^2 + 42x + 5$

D. $9x^2 + 42x + 45$

$$\text{AREA} = (3x+5)(3x+5)$$

$$= 9x^2 + 30x + 25$$

$$\text{PERIMETER} = 4(3x+5)$$

$$= 12x + 20$$

$$9x^2 + 30x + 25 - (12x + 20)$$

16.) Simplify the expression below:

$$(5x^2 - 6x - 1) - (-2x^2 + 3x - 4)$$

$$\underline{5x^2} - \underline{6x} - \underline{1} + \underline{2x^2} - \underline{3x} + \underline{4}$$

$$7x^2 - 9x - 5$$

17.) Simplify $(3x + y^2)^2$

A. $x^2 + 6xy^2 + y^4$

B. $9x^2 + 3xy^2 + y^4$

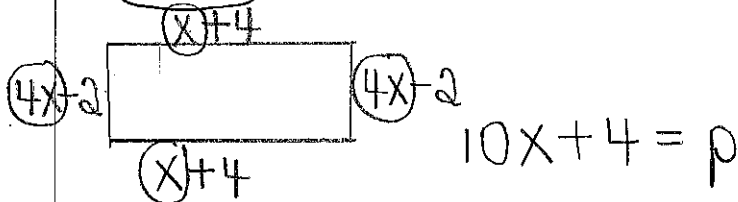
C. $9x^2 + y^4$

D. $6x + 2y^2$

$$(3x + y^2)(3x + y^2)$$

$$9x^2 + 3xy^2 + 3xy^2 + y^4$$

18.) The length of a rectangle is $x + 4$. The width of the rectangle is $4x - 2$. Write an expression to model the perimeter of the rectangle.



19.) The length of a rectangular courtyard can be represented by $(3x + 5)$ and the width by $(2x - 3)$. Which expression best represents the area of the courtyard?

A. $A = 6x^2 + x - 15$

B. $A = 5x^2 + 6x + 4$

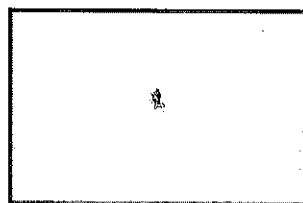
C. $A = 6x^2 - 15$

D. $A = 5x^2 + 2$

$$(3x+5)(2x-3)$$

$$6x^2 - 9x + 10x - 15$$

20.) A rectangle has a length of x inches and width 2 inches less than its length.



$(x-2)$ inches $\rightarrow 3x-6$

x inches $\rightarrow (3x)$

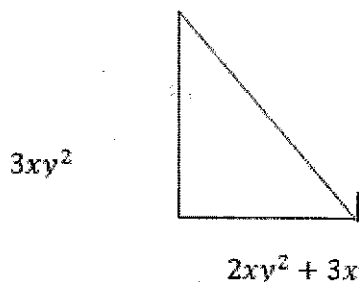
$3x(3x-6)$

$9x^2 - 18x = A$

If the dimensions were triples, what would be the area of the new rectangle in terms of x ?

21.)

The perimeter of the triangle below is $7xy^2 + 10x - 2y$. Find the length of the missing side.



$$7xy^2 + 10x - 2y - (5xy^2 + 3x)$$

$$\underline{7xy^2} + \underline{10x} - \underline{2y} - \underline{5xy^2} - \underline{3x}$$

$$2xy^2 + 7x - 2y$$

22.) Two functions are shown below:

$$f(x) = 2^x \rightarrow y_1$$

$$g(x) = 16 - 2x \rightarrow y_2$$

For what positive integer, x , will the value of $f(x)$ first exceed the value of $g(x)$?

$x = 4$

23.) A club began with four members. Each month, each member brought one new member. Which function can be used to determine the number of members x months after the club began?

A. $f(x) = 2x + 4$

B. $f(x) = 4(2)^x$

C. $y = 4(4)^x$

D. $f(x) = 4x + 2$

24.) What are the factors of $9x^2 - 36$?

$9(x^2 - 4)$

$9(x+2)(x-2)$

25.) Select the two factors of $x^2 - 4x - 60$.

$x - 6$

$x - 12$

$x - 10$

$x - 5$

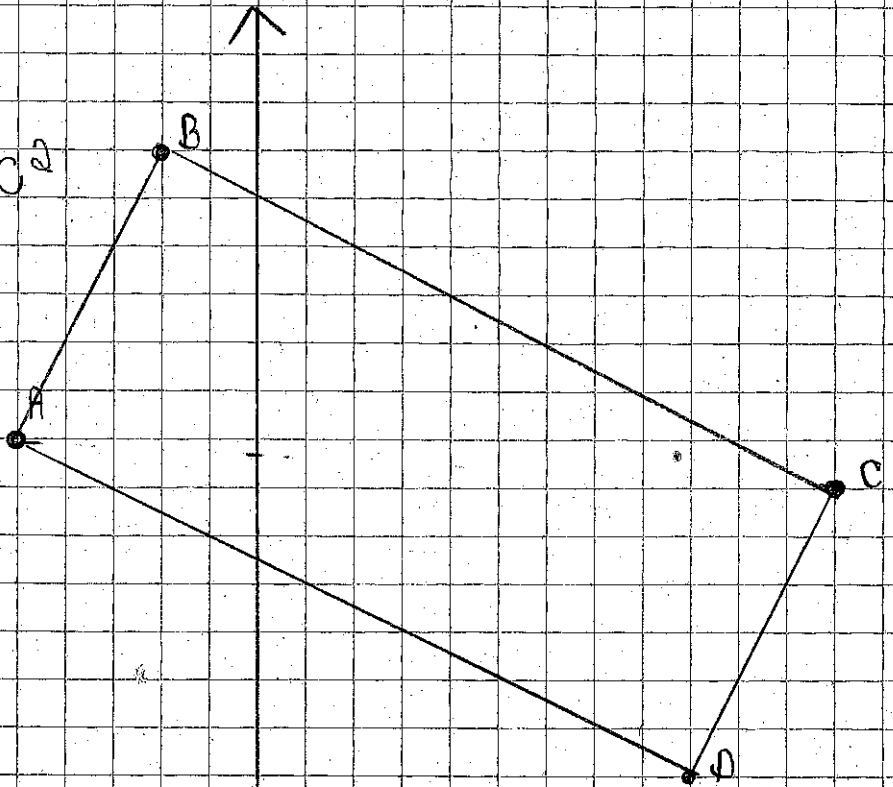
$x + 6$

$x + 10$

5.)

$$\begin{aligned}
 ab &= (10)^2 + (3)^2 = c^2 \\
 30 + 9 &= c^2 \\
 45 &= c^2 \\
 c &= \sqrt{45}
 \end{aligned}$$

$$\begin{aligned}
 bc &= (7)^2 + (14)^2 = c^2 \\
 49 + 196 &= c^2 \\
 \sqrt{245} &= c^2 \\
 c &= \sqrt{245}
 \end{aligned}$$



4)

$$\begin{aligned}
 du &= (1)^2 + (7)^2 = c^2 \quad m = \frac{-1}{7} \\
 50 &= c^2 \\
 \sqrt{50}
 \end{aligned}$$

$$\begin{aligned}
 bu &= (7)^2 + (1)^2 = c^2 \quad m = -7 \\
 50 &= c^2 \\
 \sqrt{50}
 \end{aligned}$$

$$\begin{aligned}
 bc &= (1)^2 + (7)^2 = c^2 \quad m = \frac{-1}{7} \\
 50 &= c^2 \\
 \sqrt{50}
 \end{aligned}$$

$$\begin{aligned}
 cd &= (7)^2 + (1)^2 = c^2 \quad m = 7 \\
 50 &= c^2 \\
 \sqrt{50}
 \end{aligned}$$

