Math 120
Test 1C

Student Name: _____ **Student Number:** _____

Directions:

- SHOW ALL YOUR WORK OR JUSTIFICATION FOR ANSWERS *ON THE TEST*. Scrap paper is sometimes hard to read and I want to give you partial credit!
- Simplify all answers.
- Round answers as indicated.
- Include units with final answers.

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1. Decide whether each of the following statements makes sense (is clearly true) or does not make sense (is clearly false). Fill in the right side of the table in each line with *True* for makes sense or with *False* for does not make sense.

Statement	True (makes sense) or False (does not make sense)
The slope of a vertical line is 0.	
The Difference Quotient is used to find the slope between any 2 points of a function.	
To find the zeroes (y-intercept) of a function, you find f(0).	
In an inverse relationship, the domain and range interchange.	
$f(x) = 6x + 7$ is a linear function and has a domain of $(-\infty, \infty)$.	

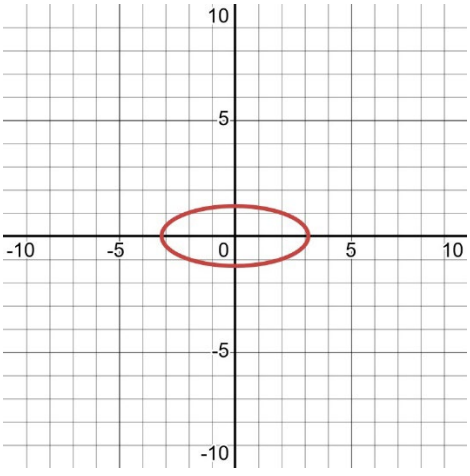
2. Determine if the following are functions. Answer YES or NO in the blank. (5 points)

a. $y = 9x - 1$ _____

b. {(5,2), (7, 9), (5, 9), (3, 0)} _____

c. x=12 _____

d. $3x^2 + y^2 = 36$ _____

e. 

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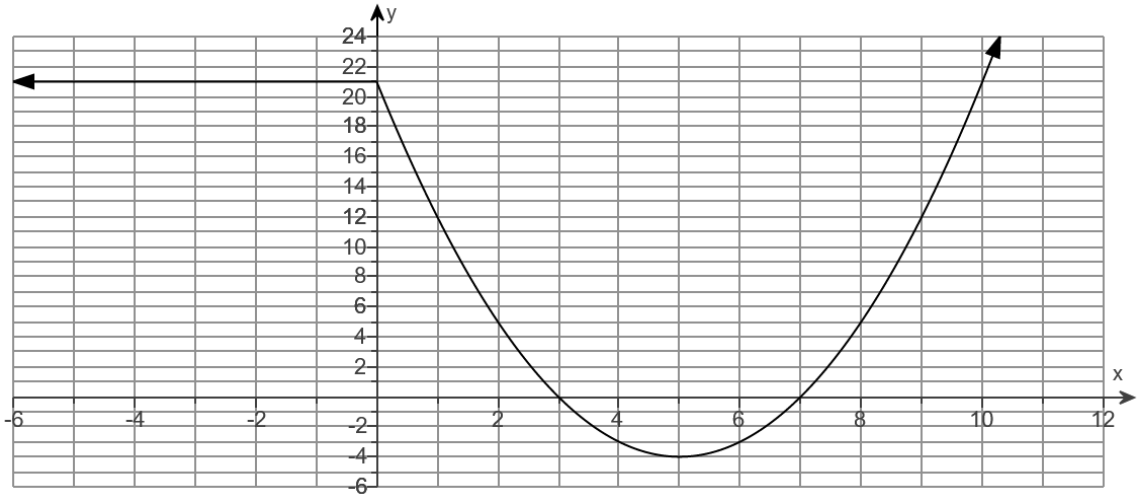
3. Use the graph below to find the following. (5 points)



a. List the x-intercept(s), if any. If there aren't any, say NONE. a._____

b. List the y-intercept(s), if any. If there aren't any, say NONE. b._____

c. Find $f(1)$ c._____

d. For what value(s) of x is $f(x) = 5$ d._____

e. State the domain in interval notation. e._____

4. Use the graph above to find the following. (5 points)

f. State the range in interval notation. f._____

g. State the interval(s) on which *f* is increasing g._____

h. State the interval(s) on which *f* is decreasing h._____

j. The number where *f* has a relative minimum j._____

k. What is the relative minimum of *f*? k._____

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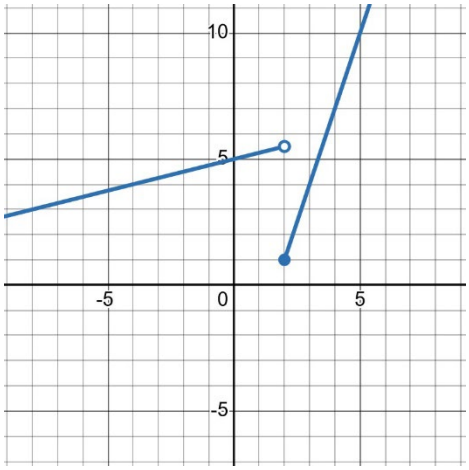
5. a. A limited-edition *Attack on Titan* anime Blu-ray box set was released for $600. Due to declining demand, its resale value has decreased by $30 per year. Write a function that describes the value of the box set, *V,* after *x* years. (3 points)

a._____

b. In how many years will the box set be worth $390? (2 points) b._____

6. Use the piecewise function shown. (5 points)

$$f(x)=\begin{cases}\frac{1}{4}x+5 & \text{if } x<2\\ 3x-5 & \text{if } x\geq 2\end{cases}$$



a. Find $f(3)$ _____

b. Find $f(-8)$ _____

7. Consider the function: $f(x)=-4x+3$

a. What is the slope? (2 points) a._____

b. Construct and simplify the **difference quotient**. (3 points) b._____

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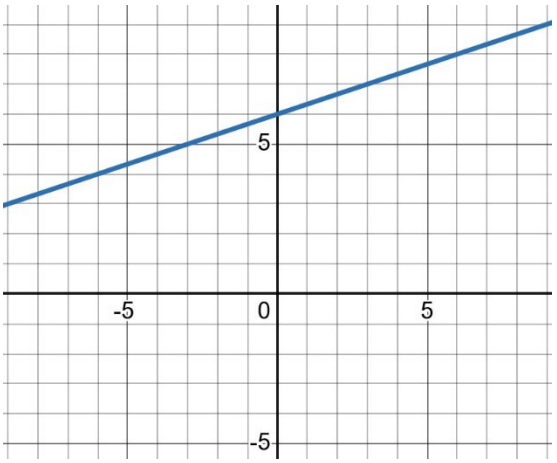
8. Find the equation of the line that goes through the point (8, -2) and has a slope of $-\frac{1}{4}$. Put your final answer in slope-intercept form. (5 points)

_____

9. Use the graph.

a. Select any two points on the graph and find the slope. (2 points)

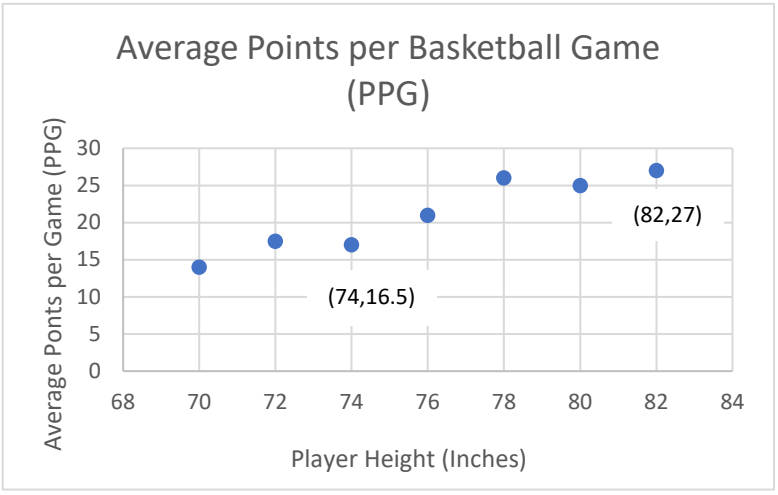
_____



b. Construct the equation for this graph. (3 points)
Put your final answer in slope-intercept form.

_____

10. Refer to the figure below.



a. Find the slope between the two points given. Simplify and round to the nearest hundredth. Include units. (3 points)

_____

b. Interpret the slope in the context of the problem including units. Answer in at least one complete sentence. (2 points)

_____

_____

_____

_____

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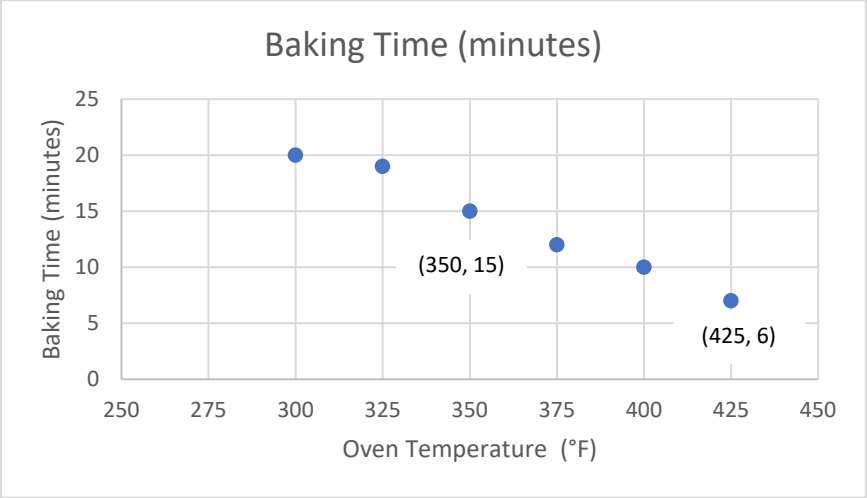
11. Find the equation of a line that is parallel to the line $f(x) = -2x + 1$ and passes through the point (-8, 10). Put your final answer in slope-intercept form. (5 points)

_____

12. Find the equation of a line that passes through the point (3,7) and the slope is undefined. (5 points)

_____

13. Use the data set below related to baking, focusing on the relationship between oven temperature and the baking time for cookies.



a. Use the two points whose coordinates are shown by the balloons to find the equation of the line that models the baking time, f(x), as it pertains to the oven temperature, x. Use function notation. Put your final answer in slope-intercept form. (3 points)

a._____

b. Use the linear function you made above to predict the baking time when the over temperature is set to 275°F. Include units. (2 points)

b._____

14. Suppose that a ball is hit off a tennis racket up in the air and then comes back down to the ground. The height of the ball above the ground as a function of time is given by the equation:

$h(t) = -4.9t^2 + 10t + 1.5$ where $h(t)$ is the height of the ball in meters and *t* is the time in seconds.

a. What is the height of the ball above the ground after t=1 seconds? Include units and do not round the answer. (1 point)

a._____

b. What is the height of the ball above the ground after t=2 seconds? Include units and do not round the answer. (1 point)

b._____

c. Using the information you found in part *a* and *b*, find the AVERAGE RATE OF CHANGE between t_1=1 second and t_2= 2 seconds. Include units and do not round the answer. (2 points)

c._____

d. Interpret the average rate of change in the context of the problem including units. Answer in at least one complete sentence. (1 points)

_____

_____

_____

_____

15. Find the domain of the given function. Write your answer in interval notation. (5 points)

$$f(x) = \frac{1}{3x - 8}$$

_____

16. Find the domain of the given function. Write your answer in interval notation. (5 points)

$$g(x) = \sqrt{x - 8}$$

_____

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17. Given $f(x) = 4x - 2$ and $g(x) = x^2 - 2x$

    a. Find $(f \circ g)(x)$ and simplify. (2 points)

    a._____

    b. Find $(g \circ f)(x)$ and simplify. (3 points)

    b._____

18. Using the functions from the previous question, find the following:

    a. Find $(f \circ g)(2)$. (2 points)

    a._____

    b. Find $(g \circ f)(4)$. (3 points)

    b._____

19. Decompose the function that follows such that $h(x) = (f \circ g)(x)$. Be sure to label which function is f and which is g. (5 points) $h(x) = \frac{6}{3x - 7}$

    _____

    _____

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20. Consider the function $f(x)=\sqrt{x-4}$ that is one-to-one.

a. Find an equation for $f^{-1}(x)$. (3 points)

a._____

b. Use interval notation to give the domain of $f^{-1}(x)$. (2 points)

b._____

OPTIONAL EXTRA CREDIT QUESTION:

Construct and simplify the difference quotient for the following function:

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

_____

Formula Sheet: Math 120

Straight Line

Slope Intercept form

$y = mx + b$

Point-slope form

$y - y_1 = m(x - x_1)$

Slope

$m = \frac{y_2 - y_1}{x_2 - x_1}$

Difference Quotient

$\frac{f(x+h) - f(x)}{h}$

Quadratic Formula

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Logarithms

$\log_b(MN) = \log_b M + \log_b N$

$\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$

$\log_b M^P = P \log_b M$

Distance: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Circle: $(x-h)^2 + (y-k)^2 = r^2$

Quadratic Function

$f(x) = a(x-h)^2 + k$, Vertex $= (h,k)$

$f(x) = ax^2 + bx + c$, Vertex $= \left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Continuous Compound Interest: $A = Pe^{rt}$

Arithmetic Sequence

$a_n = a_1 + (n-1)d$

$s_n = \frac{n}{2}(a_1 + a_n)$

Geometric Sequence

Finite: $a_n = a_1 r^{n-1}$ $\quad s_n = \frac{a_1(1-r^n)}{1-r}, r \neq 1$

Infinite: $s = \frac{a_1}{1-r}$, $|r| < 1$

Even function

$f(-x) = f(x)$

Odd function

$f(-x) = -f(x)$