Name: **Key**

Recitation Instructor, Day, Time:

TRADITIONAL MATH 100 – Exam 1 – September 2017

Directions: You will find 16 problems listed below. No notes/books/friends are allowed. Graphing calculator models above the level of a TI-84 plus are not allowed. You have one hour to complete this exam.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

1. (6 points) Find the union. Express answers in **interval notation** and on a **number line**:
   $(4, 10] \cup [-4, \infty)$

   Answer on # line

   Interval Notation:

   $[-4, \infty)$
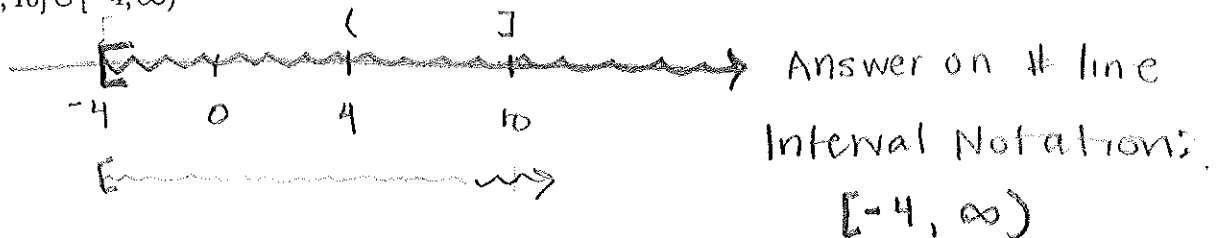
2. (6 points) Consider the graph of $h(x) = x^2$. Using appropriate terminology as discussed in lecture, describe how the graph of $h(x - 3) + 7$ would look.

   $h(x)$ would be shifted right 3 units and vertically upward by 7 units.

3. (6 points) Find the distance between the two points $(9, 2)$ and $(-14, 7)$. Leave answer in radical form, i.e., decimal approximations are NOT allowed. If you use any formulas, clearly (and correctly) write them down so we can assign partial credit when applicable.

   $x_1\ y_1 \qquad x_2\ y_2$

   $\text{distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

   $= \sqrt{(9 - (-14))^2 + (2 - 7)^2}$

   $= \sqrt{23^2 + (-5)^2}$

   $= \sqrt{529 + 25} = \boxed{\sqrt{554}}$

4. (8 points) Consider $g(x) = -4x^3 + Mx$, where M is some external parameter. Answer the following:

(a) Find $g(-2)$. $g(-2) = -4(-8) + M(-2) = \boxed{32 - 2M}$

(b) Find $g(1)$. $g(1) = -4(1) + M(1) = \boxed{-4 + M}$
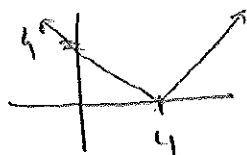
(c) Find $g(-3)$. $g(-3) = -4(-27) + M(-3) = \boxed{108 - 3M}$

(d) Find $g(4)$. $g(4) = -4(64) + M(4) = \boxed{-256 + 4M}$

5. (6 points) Answer the following; no partial credit will be awarded on this problem.

(a) TRUE or FALSE: An even function refers to a function whose graph is symmetric with respect to the y-axis.

(b) TRUE or FALSE: $f(x) = |x - 4|$ is an even function.

6. (6 points) Solve for x: $-7(x - 2) + 3 = 5(x + 1) - 14$

$-7x + 14 + 3 = 5x + 5 - 14$

$-12x + 17 = -9$

$-12x = -26$

$x = \dfrac{26}{12} = \boxed{\dfrac{13}{6}}$

7. (6 points) Given $f(x) = 3x^2$, find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$.

$$\frac{f(x+h) - f(x)}{h} = \frac{3[x^2 + 2xh + h^2] - 3x^2}{h}$$

$$= \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$$

$$= \frac{3h(2x+h)}{h} = \boxed{3(2x+h)}$$

$$\text{or} \quad 6x + 3h$$

8. (8 points) Suppose the cost function for a certain product is given by $C(x) = 15x + 600$ and the revenue function for the product is given by $R(x) = 28x$. Find a formula for the following functions:

(a) Profit Function, $P(x)$

$$P(x) = R(x) - C(x) = 28x - [15x + 600] = 13x - 600$$

(b) Average Cost Function, $\overline{C(x)}$

$$\overline{C(x)} = \frac{C(x)}{x} = \frac{15x + 600}{x} = 15 + \frac{600}{x}$$

↗ either one fine

9. (6 points) In a controlled lab environment, some organisms exhibit constant growth over a specific time period. Suppose a certain organism starts out weighing 0.5 mg, and grows to 1.7 mg over a 24 hour time period. Find a linear model that describes the growth of the organism for $0 \le t \le 24$ hours.

$$(t, \text{weight})$$
$$(0, .5 \text{ mg})$$
$$(24, 1.7 \text{ mg})$$

$$\text{Slope} = \frac{1.7 - .5}{24 - 0} = \frac{1.2 \text{ mg}}{24 \text{ hrs}} = .05 \text{ mg/hr}$$
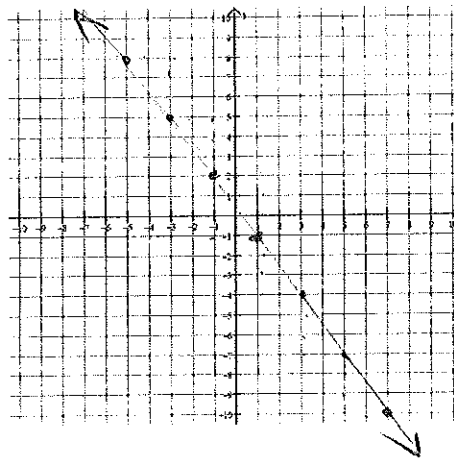
$$\boxed{f(t) = .05t + .5}$$

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$$0 \le t \le 24 \text{; } t \text{ in hours}.$$

10. (6 points) Given $f(x) = 5x^2$ and $g(x) = x - 3$, find $(fg)(-2)$.

$$(fg)(-2) = f(-2) \, g(-2) \; ,$$
$$= 5(4)(-5) \; ,$$
$$= \boxed{-100}$$

11. (6 points) Graph a line with a slope of $-3/2$ passing through the point $(1, -1)$. Include at least four points on your graph.

12. (6 points) Consider $x + y = 16$. Is y a function of x? Explain in COMPLETE SENTENCES, using terminology learned in class.

Yes; this is a line with slope of -1 and passes vertical line test.

(other correct explanations will also be accepted)

13. (6 points) Find the midpoint between the two points $(5, 9)$ and $(-21, 3)$. If you use any formulas, clearly (and correctly) write them down so we can assign partial credit when applicable.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \quad \left(\frac{(5-21)}{2}, \frac{(9+3)}{2} \right) = \boxed{(-8, 6)} \; .$$

Mdpt Formula.

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14. (6 points) On the grid below, graph the relation $\{(x, y)|y \leq -4\}$
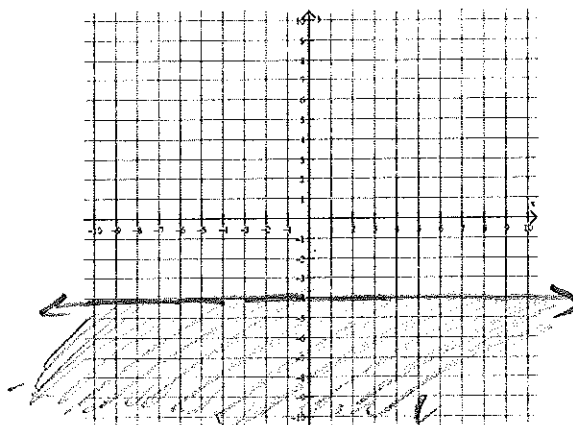
15. (6 points) Find an equation of the line passing through $(-3, 8)$ and parallel to $x - 2y = 6$.

Given line: $2y = x - 6$ $m = \frac{1}{2}$;

$y = \frac{1}{2}x - 3$

$$\boxed{y - 8 = \frac{1}{2}(x + 3)}$$

Either one fine

OR $\boxed{y = \frac{1}{2}x + \frac{19}{2}}$

16. (6 points) Consider the following piecewise function. Which of the statements given below are true? You may circle more than one choice if necessary.

$$f(x) = \begin{cases} 10, & x \leq -2 \\ 4x, & -2 < x \leq 2 \\ x^4, & x > 2 \end{cases}$$

(a) $f(-2) = -8$.
(b) $f(-2) = 10$.
(c) $f(-2) = 16$.
(d) $f(-3) = -12$.
(e) $f(-3) = 81$.
(f) $f(5) = 625$.

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