CJ.

Name: Key
Recitation Instructor, Day, Time:

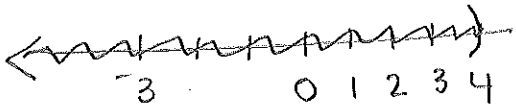
TRADITIONAL MATH 100 – Exam 1 – September 13, 2016

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**: $(-\infty, 2] \cup [-3, 4)$

Interval notation: $(-\infty, 4)$

Number line: 

2. (6 points) Consider the graph of $h(x) = x^2$. Using appropriate terminology as discussed in lecture, describe how the graph of $6h(x)$ would look.

$6h(x)$ would have the shape of $h(x)$, but stretched vertically by a factor of 6.

3. (6 points) Find the distance between the two points $(1, 4)$ and $(-22, 9)$. Leave answer in simplified 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.

$x_1\ y_1 \qquad x_2\ y_2$

distance between (x_1, y_1) & (x_2, y_2):

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

$$d = \sqrt{(1-(-22))^2 + (4-9)^2} = \sqrt{23^2 + (-5)^2}$$

$$= \sqrt{23^2 + 25}$$

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

$$= \boxed{\sqrt{554}}$$

Lauren 4. (8 points) Consider $g(x) = 4x^2 + dx$, where d is some external parameter. Answer the following:

(a) Find $g(-2)$. $g(-2) = 4(-2)^2 + d(-2) = 16 - 2d$

(b) Find $g(1)$. $g(1) = 4(1)^2 + d(1) = 4 + d$

(c) Find $g(-3)$. $g(-3) = 4(-3)^2 + d(-3) = 36 - 3d$

(d) Find $g(4)$. $g(4) = 4(4)^2 + d(4) = 64 + 4d$

5. (6 points) Solve for x: $7(x-2)+3 = 5(x+1)-4$

$7x - 14 + 3 = 5x + 5 - 4$

$7x - 11 = 5x + 1$

$2x = 12$

$\boxed{x = 6}$

Jiang 6. (6 points) Is the function $f(x) = 3x^2$ even, odd, or neither? In order to receive full credit, you must use the definitions of even/odd functions to justify your answers.

Definition of odd: $f(-x) = -f(x)$

Definition of even: $f(-x) = f(x)$

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

Therefore $f(x) = f(-x)$ and $f(x)$ is even.

(Note that the definition of odd doesn't hold for this function)

Carrie

7. (6 points) Given $f(x) = 6x - 5$, find the difference quotient $\frac{f(x+h) - f(x)}{h}$.

$f(x+h) = 6(x+h) - 5 = 6x + 6h - 5$

$f(x+h) - f(x) = 6x + 6h - 5 - (6x - 5)$

$= 6h$

$\frac{f(x+h) - f(x)}{h} = \frac{6h}{h} = \boxed{6}$

8. (8 points) Suppose the cost function for a certain product is given by $C(x) = 10x + 400$ and the revenue function for the product is given by $R(x) = 22x$. Find a formula for the following functions:

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

$P(x) = R(x) - C(x) = 22x - (10x + 400) = 12x - 400$

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

$\overline{C(x)} = \frac{C(x)}{x} = \frac{10x + 400}{x}$ or $\overline{C(x)} = 10 + \frac{400}{x}$

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 2 mg, and grows to 18 mg over a 24 hour time period. Find a linear model that describes the growth of the organism for $0 \leq t \leq 24$ hours.

t w
(time, weight)
(0, 2mg)
(24, 18mg)

Slope $= \frac{\Delta w}{\Delta t} = \frac{18 - 2}{24 - 0}$ ← mg, ↖ hours

$= \frac{16}{24}$

$= \frac{2}{3}$ mg/hour

Linear model:

$w = \frac{2}{3}t + 2$, t in hours, w in mg.

or $f(t) = \frac{2}{3}t + 2$

(point slope form is fine).

Horace

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

$(fg)(2) = f(2)g(2)$

$= (12)(-3)$

$= \boxed{-36}$

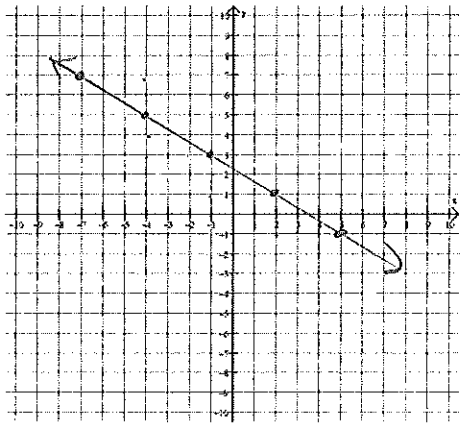
or

$(fg)(x) = 3x^3 - 15x^2$

$(fg)(2) = 24 - 60$

$= \boxed{-36}$

11. (6 points) Graph a line with a slope of $-2/3$ passing through the point $(-4, 5)$. Include at least four points on your graph.



Bret

12. (6 points) Consider $x^2 + y^2 = 16$. Is y a function of x? Explain in COMPLETE SENTENCES, using terminology learned in class.

No. A single input yields 2 outputs instead of just one output.

Example: when $x = 0$, $y = 4$

when $x = 0$, $y = -4$ as well.

13. (6 points) Find the midpoint between the two points $(1, 4)$ and $(-22, 9)$. If you use any formulas, clearly (and correctly) write them down so we can assign partial credit when applicable.

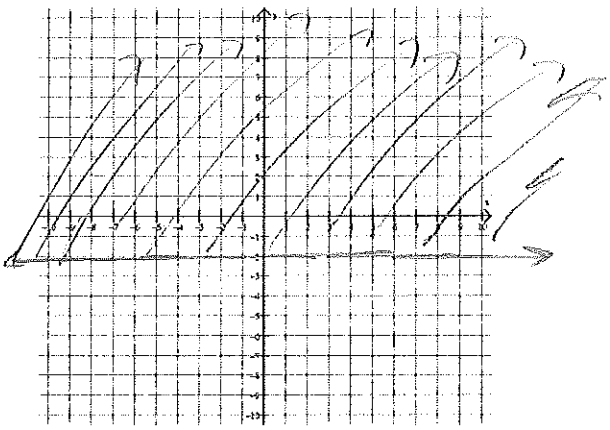
midpoint of (x_1, y_1) & (x_2, y_2) is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

So $\left(\frac{1 + (-22)}{2}, \frac{4 + 9}{2}\right) = \left(\frac{-21}{2}, \frac{13}{2}\right)$

is the midpoint.

Prem

14. (6 points) On the grid below, graph the relation $\{(x, y)|y \geq -2\}$



15. (6 points) Find an equation of the line passing through $(-3, 8)$ and parallel to $4x - 2y = 8$.

Slope of given line should be found first.

$$-2y = -4x + 8$$
$$y = 2x - 4$$

Slope of new line: $m = 2$

New line: $y - 8 = 2(x + 3)$ OR $y = 2x + 14$

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.

$$f(x) = \begin{cases} 6, & x \leq -2 \\ 2x, & -2 < x \leq 2 \\ x^3, & x > 2 \end{cases}$$

(a) $f(-2) = 6$.
(b) $f(-2) = -4$.
(c) $f(-2) = -8$.
(d) $f(-3) = 6$.
(e) $f(-3) = -27$.
(f) $f(5) = 125$.