

Name: KEY

Recitation Instructor and Time: _____

Studio College Algebra – Exam 1
February 5, 2008

Directions: There are 16 problems on this exam. Please show all your work.

1. Complete the following function table for $f(x) = 3x^2 - 2x + 1$.

x	-2	-1	0	1	2
$f(x)$	17	6	1	2	9

$$\begin{aligned} f(-2) &= 3(-2)^2 - 2(-2) + 1 \\ &= 3(4) + 4 + 1 \\ &= 17 \end{aligned}$$

$$\begin{aligned} f(1) &= 3(1)^2 - 2(1) + 1 \\ &= 3(1) - 2 + 1 \\ &= 2 \end{aligned}$$

$$\begin{aligned} f(-1) &= 3(-1)^2 - 2(-1) + 1 \\ &= 3(1) + 2 + 1 \\ &= 6 \end{aligned}$$

$$\begin{aligned} f(2) &= 3(2)^2 - 2(2) + 1 \\ &= 3(4) - 4 + 1 \\ &= 9 \end{aligned}$$

$$f(0) = 3(0)^2 - 2(0) + 1 = 1$$

2. Rewrite the formula $a(y) = \frac{2b}{y+5b}$ at $y = 3b$, and simplify completely.

$$\underbrace{a(3b)}_{\text{function notation}} = \frac{2b}{3b+5b} = \frac{2b}{8b} = \boxed{\frac{1}{4}}$$

3. Solve for x : $15x - 3 = 3x + 21$.

$$\begin{array}{r} 15x - 3 = 3x + 21 \\ \underline{-3x} \quad \underline{-3x} \\ 12x - 3 = 21 \\ \quad \underline{+3} \quad \underline{+3} \end{array}$$

$$\frac{12x}{12} = \frac{24}{12}$$

$$\boxed{x = 2}$$

Check:

$$15(2) - 3 = 27$$

$$3(2) + 21 = 27 \quad \checkmark$$

4. Suppose $x = 2$ solves $Kx - 3 = 4x + K$. Solve for K .

$$k(2) - 3 = 4(2) + k$$

$$2k - 3 = 8 + k$$

$$\underline{-k} \quad \underline{-k}$$

$$k - 3 = 8$$

$$\underline{+3} \quad \underline{+3}$$

$$\boxed{k = 11}$$

Check:

$$kx - 3 = 4x + k$$

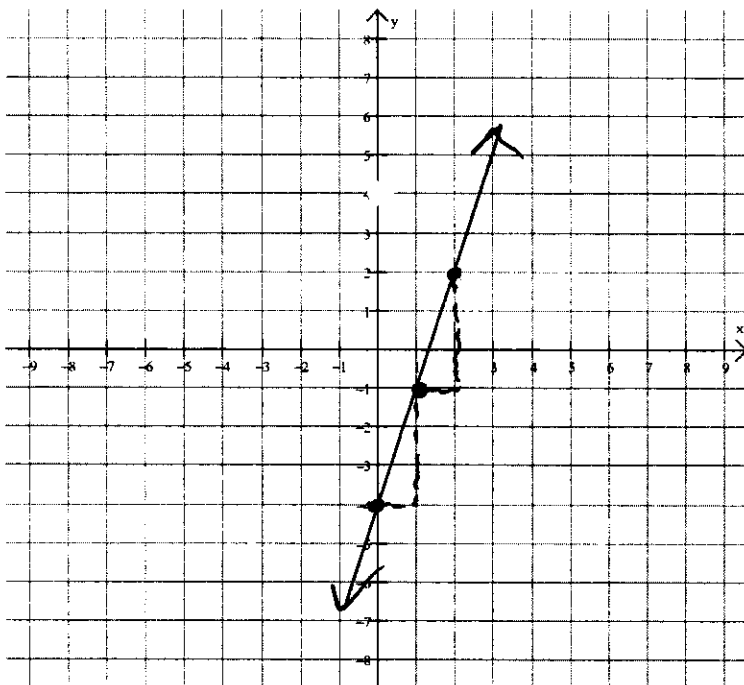
$$(11)(2) - 3 \stackrel{?}{=} 4(2) + 11$$

$$22 - 3 \stackrel{?}{=} 8 + 11$$

$$19 = 19 \quad \checkmark$$

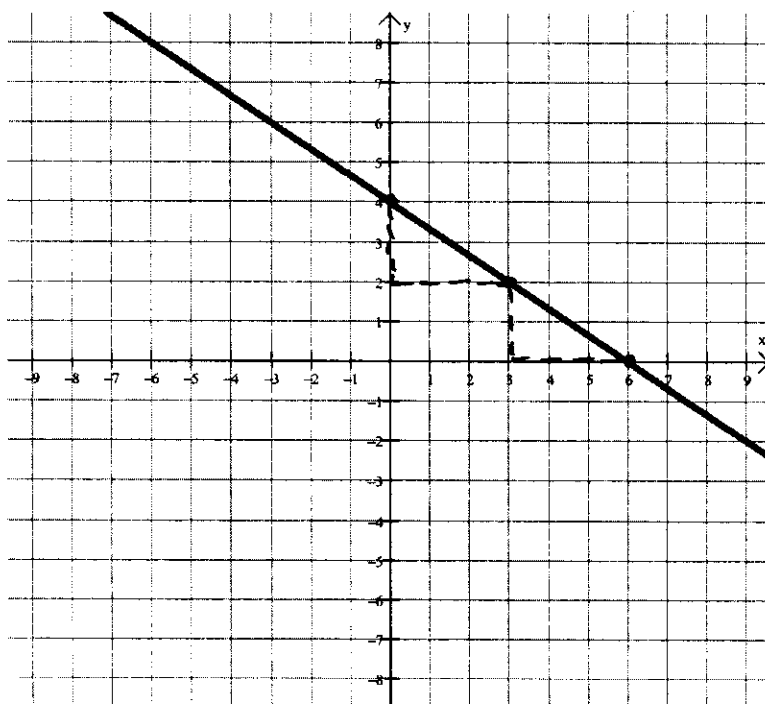
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5. Graph $3x - y = 4$ on the grid given below.



$$\begin{aligned} 3x - y &= 4 \\ +y & \quad +y \\ \hline 3x &= y + 4 \\ -4 & \quad -4 \\ \hline 3x - 4 &= y \\ m = 3 & \text{ or } \frac{3}{1} \\ b = -4 & \end{aligned}$$

6. Find the equation of the graph given below.



$$\begin{aligned} \text{y-intercept} &= 4 \\ m &= -\frac{2}{3} \end{aligned}$$

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

7. Suppose a line passes through (4,2) and (6,5). What is another point on the line?

$$\text{Slope} = \frac{5-2}{6-4} = \frac{3}{2}$$

Equation of line passing through these points:

$$y - y_0 = m(x - x_0)$$

$$y - 5 = \frac{3}{2}(x - 6)$$

$$y - 5 = \frac{3}{2}x - 9$$

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

$$\text{If } x = 2,$$

$$y = \frac{3}{2}(2) - 4$$

$$= 3 - 4$$

$$= -1$$

$$\boxed{(2, -1)} \leftarrow \text{one possibility}$$

8. Solve: $3x - 4 > 8 - 5x$

$$\begin{array}{r} +5x \quad +5x \\ \hline \end{array}$$

$$8x - 4 > 8$$

$$\begin{array}{r} +4 \quad +4 \\ \hline \end{array}$$

$$\frac{8x}{8} > \frac{12}{8}$$

$$\boxed{x > \frac{3}{2}}$$

9. Solve: $2x+3 < 5x+6 < 3x+8$

$$\begin{array}{r}
 2x+3 < 5x+6 \\
 \underline{-3} \quad \underline{-3} \\
 2x < 5x+3 \\
 \underline{-5x} \quad \underline{-5x} \\
 -3x < 3 \\
 \underline{-3} \quad \underline{-3} \\
 x > -1
 \end{array}
 \quad \text{AND} \quad
 \begin{array}{r}
 5x+6 < 3x+8 \\
 \underline{-6} \quad \underline{-6} \\
 5x < 3x+2 \\
 \underline{-3x} \quad \underline{-3x} \\
 2x < 2 \\
 \underline{2} \quad \underline{2} \\
 x < 1
 \end{array}$$

AND

$-1 < x < 1$

10. Solve the system for x and y, if possible. $\begin{cases} x+2y=6 \\ 2x-8y=-12 \end{cases}$

Using Elimination

$$\begin{cases} -2(x+2y=6) \\ 2x-8y=-12 \end{cases}$$

$$\begin{cases} -2x-4y=-12 \\ 2x-8y=-12 \end{cases}$$

$$-12y = -24$$

$y = 2$

Substitute

$$\begin{aligned}
 x+2(2) &= 6 \\
 x+4 &= 6 \\
 \boxed{x=2}
 \end{aligned}$$

Solution: $\boxed{(2, 2)}$

or Using Substitution:

$$\begin{aligned}
 x &= 6-2y \\
 2(6-2y)-8y &= -12 \\
 12-4y-8y &= -12 \\
 -12y &= -24 \\
 \boxed{y=2}
 \end{aligned}$$

$$\begin{aligned}
 x &= 6-2(2) \\
 x &= 6-4 \\
 \boxed{x=2}
 \end{aligned}$$

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11. A vehicle depreciates in value according to a linear pattern. If the initial value of the vehicle is \$22,000, and the value ten years later is \$0, what will the depreciated value be after 6 years?

$$(0, 22,000)$$
$$(10, 0)$$

$$\text{Slope: } \frac{22,000 - 0}{0 - 10} = -2200$$

y-intercept is 22,000

$$\text{Depreciation equation: } y = -2200x + 22,000$$

$$\text{Plug in 6 for } x: y = -2200(6) + 22,000$$
$$y = \$8800$$

After 6 yrs, vehicle's value is ~~\$8800~~.

12. The supply for a product is given by $2p - 2q = 220$, and the demand for the product is given by $p + 3q = 470$. Find the equilibrium point.

$$\begin{cases} 2p - 2q = 220 \\ -2(p + 3q) = -940 \end{cases}$$

$$\begin{cases} 2p - 2q = 220 \\ -2p - 6q = -940 \end{cases}$$

$$\hline -8q = -720$$

$$q = 90$$

$$p + 3q = 470$$

$$p + 3(90) = 470$$

$$p + 270 = 470$$

$$p = 200$$

Equilibrium point: 90 units = q $(90, \$200)$
 $\$200 = p$

13. Suppose the cost function for a certain product is given by $C(x) = 10x + 3000$ and the revenue function for the product is given by $R(x) = 35x + 2000$. What values of x will result in profit?

$$\begin{aligned}
 R(x) &> C(x) \\
 35x + 2000 &> 10x + 3000 \\
 \underline{-10x} \quad \quad \quad \underline{-10x} \\
 25x + 2000 &> 3000 \\
 \underline{-2000} \quad \quad \underline{-2000} \\
 25x &> 1000 \\
 \boxed{x > 40 \text{ units}}
 \end{aligned}$$

14. The temperature T in degrees Fahrenheit inside a concert hall m minutes after a power outage during a winter concert is given by $T(m) = -0.5m + 80$. Write and solve an inequality that describes when the temperature is below 65 degrees.

$$\begin{aligned}
 -0.5m + 80 &< 65 \\
 \underline{-80} \quad \quad \underline{-80} \\
 -0.5m &< -15 \\
 \underline{-0.5} \quad \quad \underline{-0.5} \\
 m &> 30.
 \end{aligned}$$

After 30 minutes, the room's temperature will be below 65°.

15. The equation $5F - 9C = 160$ gives the relationship between Fahrenheit and Celsius temperature measurements. What Celsius measure corresponds to a Fahrenheit measure of 120° ?

$$5F - 9C = 160$$

$$5(120) - 9C = 160$$

$$600 - 9C = 160$$

$$\begin{array}{r} -9C = -440 \\ \hline -9 \quad \quad \quad \hline -9 \end{array}$$

$$C \approx 48.9^\circ$$

16. If the number of cell phone subscribers (in millions) between the years 1993 and 1997 could be described by the model $P(x) = 12x + 33$, where x is the number of years since 1993, answer the following:

a) What is $P(0)$?

$$P(0) = 12(0) + 33 = 33$$

33 million subscribers

b) What does your answer in part (a) mean?

Initially, in 1993, there were 33 million cell phone subscribers. (This is the y-intercept of the function $P(x)$).