

Name: _____

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Recitation Instructor and Time: _____

Studio College Algebra – Exam 1
September 15, 2009

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

1. Complete the following function table for $f(x) = 5x^3 - 7x$.

x	-2	-1	0	1	2
$f(x)$	-26	2	0	-2	26

$$\begin{aligned} f(-2) &= 5(-2)^3 - 7(-2) \\ &= 5(-8) + 14 \\ &= -40 + 14 = -26 \end{aligned}$$

$$\begin{aligned} f(1) &= 5(1)^3 - 7(1) \\ &= 5 - 7 = -2 \end{aligned}$$

$$\begin{aligned} f(-1) &= 5(-1)^3 - 7(-1) \\ &= -5 + 7 = 2 \end{aligned}$$

$$\begin{aligned} f(2) &= 5(2)^3 - 7(2) \\ &= 5(8) - 14 \\ &= 40 - 14 = 26 \end{aligned}$$

$$f(0) = 0$$

2. Rewrite the formula $R(g) = \frac{2c+g}{7c}$ at $g = 12c$, and simplify completely.

$$\begin{aligned} R(12c) &= \frac{2c + 12c}{7c} \\ &= \frac{14c}{7c} \\ &= \boxed{2} \end{aligned}$$

3. Solve for x : $-4x+14=12x+22$.

$$14 = 16x + 22$$

$$-8 = 16x$$

$$\frac{-8}{16} = \frac{16x}{16}$$

$$\boxed{x = -\frac{1}{2}}$$

4. Suppose $x=2$ solves $Kx+7=4x-K$. Solve for K .

$$k(2)+7=4(2)-K$$

$$2K+7=8-K$$

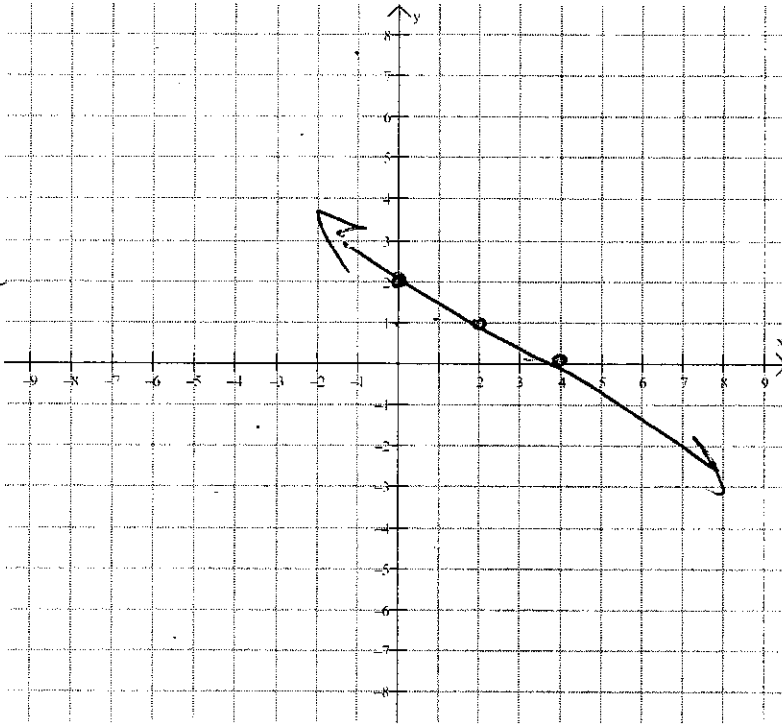
$$3K = 1$$

$$\boxed{K = \frac{1}{3}}$$

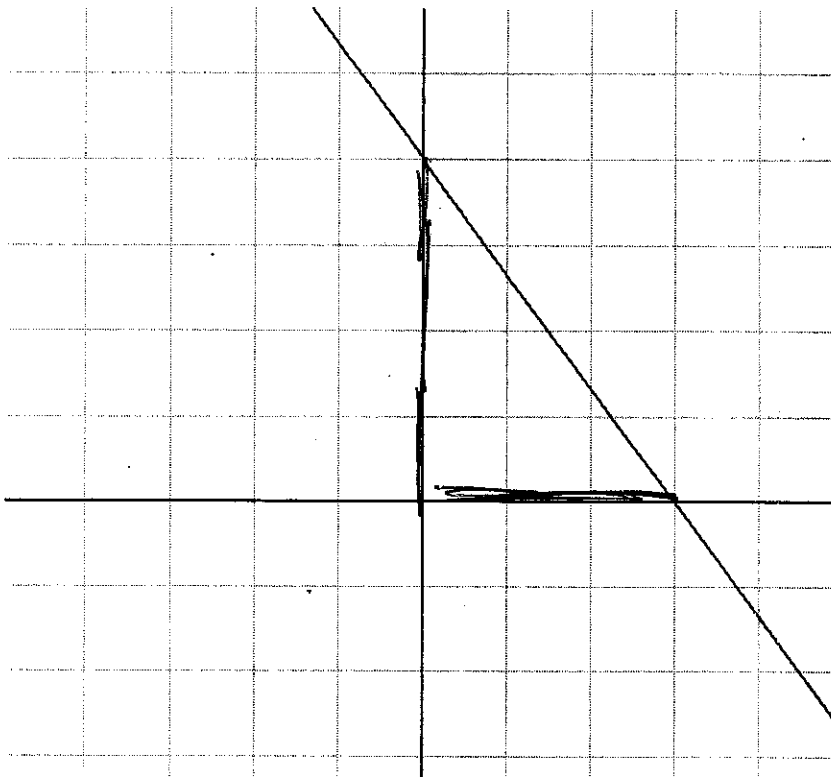
5. Graph $4y + 2x = 8$ on the grid given below.

$$\frac{4y}{4} = \frac{-2x + 8}{4}$$

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



6. Find the equation of the line given below.



$$b = 4$$

$$\text{slope} = -\frac{4}{3}$$

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

7. The weekly profit function for a business is $P(x) = 2x - 1000$, where x is the number of customers. How many more customers must the business add if it wants to increase profits by \$100 a week?

The marginal profit from adding 1 customer is the slope of this function, \$/customer
So, to increase profits by \$100, one needs $(2)(50)$ customers = \$100.

Answer: 50 customers

8. Solve: $\frac{7}{3}x - 6 \geq \frac{1}{3}x - 12$

$$\frac{6}{3}x \geq -6$$

$$\frac{2x}{2} \geq \frac{-6}{2}$$

$$x \geq -3$$

9. Solve: $80 < \frac{365+x}{5} < 90$

$$80 < \frac{365+x}{5} \quad \text{and} \quad \frac{365+x}{5} < 90$$

$$400 < 365+x \quad \text{and} \quad 365+x < 450$$

$$35 < x \quad \text{and} \quad x < 85$$

$$\boxed{35 < x < 85}$$

10. Solve the system for x and y , if possible. $\begin{cases} 2x-3y=5 \\ 5x+4y=1 \end{cases}$

$$\begin{aligned} -5(2x-3y=5) \\ 2(5x+4y=1) \end{aligned}$$

$$\begin{aligned} -10x+15y &= -25 \\ 10x+8y &= 2 \\ \hline 23y &= -23 \\ y &= -1 \end{aligned}$$

$$2x-3(-1)=5$$

$$2x+3=5$$

$$2x=2$$

$$x=1$$

$$\boxed{\begin{aligned} x &= 1 \\ y &= -1 \end{aligned}}$$

11. Suppose that a company's daily profit from the production and sale of a certain product is given by the function $P(x) = 7x - 1750$ dollars, where x is the number of units produced and sold. What level of production and sales must occur for the company to break even?

$$7x - 1750 = 0$$

$$7x = 1750$$

$$x = \frac{1750}{7}$$

$$x = 250 \text{ units}$$

12. A rental car company depreciates its vehicles using a straight-line depreciation method. Suppose that a new vehicle is initially worth \$24,000, and 40 years later it is worth \$0. How much is the vehicle worth after 13 years?

$$(0, 24,000)$$

$$(40, 0)$$

$$m = \frac{24,000}{-40} = -600/\text{yr}$$

$$y = -600x + 24,000$$

After 13 yrs:

$$-600(13) + 24,000 =$$

$$\boxed{\$16,200}$$

Note:
 $(0, 24,000)$ is
 the y-intercept

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~~32,903.77~~ 32,903.77

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13. The average classroom teacher salary in the United States is given by the function $f(t) = 982.06t + 32,903.77$, where t is the number of years from 1990. In what year was the average teacher salary \$40,760.25?

$$40,760.25 = 982.06t + 32,903.77$$

$$7856.48 = 982.06t$$

$$8.79 = t$$

In 1998

14. The total cost of a refrigerator is \$1579.89, which includes a 7.3% sales tax. What was the price of the refrigerator **before** adding in the sales tax?

$$1.073x = 1579.89,$$

where x = cost of fridge
before sales tax

$$x = \$1472.40$$

15. The mean (expected) time y in prison for a serious crime can be approximated by a function of the mean sentence length x , with $y = .55x - 2.886$, where x and y are in months. According to this model, how many months should a judge sentence a criminal so that the criminal will be expected to serve between 48 and 72 months?

$$48 < .55x - 2.886 < 72$$

$$48 < .55x - 2.886 \text{ and } .55x - 2.886 < 72$$

$$50.886 < .55x \text{ and } .55x < 74.886$$

$$92.5 < x \text{ and } x < 136.156$$

Between 93 and 136 months

16. A concert organizer needs to make \$120,000 from the sale of 2600 tickets. The organizer charges \$40 for some tickets and \$60 for other tickets. How many of each type of ticket must be sold to achieve the desired revenue of \$120,000?

Let $x = \#$ of \$40 tickets

$y = \#$ of \$60 tickets

$$40(x + y = 2600)$$

$$40x + 60y = 120,000$$

$$20y = 16,000$$

$$y = 800 \text{ tickets}$$

$$x = 1800 \text{ tickets}$$