MAT 105 – Regular Test #2
Sample #6

RT #2 typically includes problems like the following along with DRT, mixture, and piecewise function problems (which are not sampled here – see The Fundamentals). There may be other problems which are not exemplified here, so be sure you study all the ideas covered in your section of the course. The ANSWERS are found at the end of this document.

See other Samples for more practice.

1. Write an equation for a non-horizontal, non-vertical line having the stated property:
(i) slope A; (ii) y-intercept A; (iii) x-intercept A; (iv) contains the point (A, B)

2. (Use a graph and round to **4** decimal places.) Consider the formula $A = \dfrac{380a}{a^2 + 5}$. (i) Find A when $a = 27.41$; (ii) Find a when $A = 71.97$ for the second time.

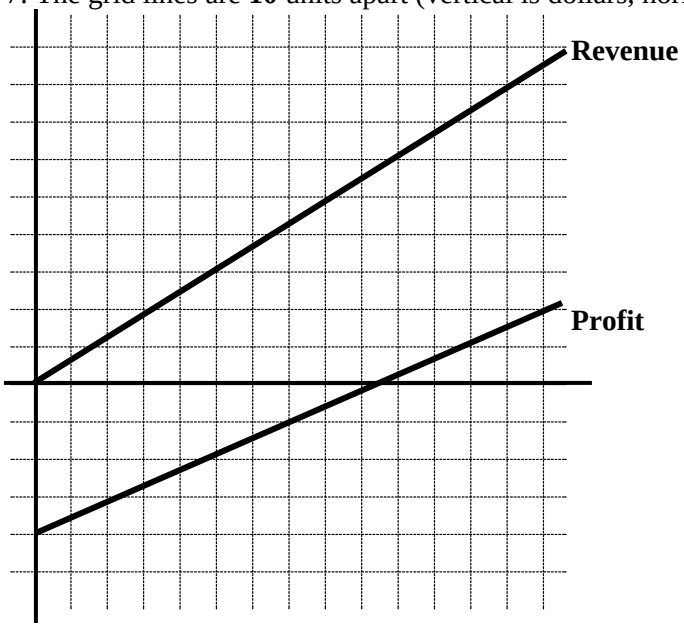
3. Find the (i) x-intercept, (ii) y-intercept, and (iii) slope for $2x + 9y = 4$.

4. At **30** mph I get **32** miles per gallon, but at **54** mph I only get **26** miles per gallon. Assuming there is a linear relationship between the variable quantities here, write a linear equation that describes that relationship.

5. Using the x,y-axis system, find an equation of the line through $(-2, 5)$ which is parallel to the line $y = x$.

6. Find another point on the line through (R, T) with slope $\dfrac{7}{3}$.

7. The grid lines are **10** units apart (vertical is dollars, horizontal is # of units).



(i) Roughly, what are the fixed costs?
(ii) Roughly, to have **$40** in revenue, how many units must be sold?
(iii) Roughly, what is the cost to make **50** units?
(iv) Roughly, how many units must be sold to break even?

8. Solve this system by the addition method (no decimal answers): $\begin{cases} -2x + 5y = 3 \\ 6x - 15y = 1 \end{cases}$.

9. Marty can spread the fertilizer alone in **45** minutes, but if Tanya helps him, the job can be done in **20** minutes. Set up the equation needed to determine how long it would take Tanya alone to fertilize the lawn.

10. Find the slope of the line through $(3, 5)$ and $(-7, 5)$.

11. Find the value of k so that the point $(3, -2)$ will lie on the graph of $2kx + ky = 5$.

BRIEF ANSWERS (Detailed answers start in the middle of this page):

1. These are sample correct responses. The underlined values can be changed as you want (within reason, of course):

(i) $y = Ax + \underline{5}$; (ii) $y = \underline{3}x + A$; (iii) $y = \underline{-4}(x - A)$; (iv) $y - B = \underline{2}(x - A)$

2. (i) **13.7719**; (ii) **4.0434**

3. (i) **2**; (ii) $\frac{4}{9}$; (iii) $\frac{-2}{9}$

4. S is the speed in mph, F is the fuel efficiency in mpg; $F - 32 = \frac{-1}{4}(S - 30)$ or $F - 26 = \frac{-1}{4}(S - 54)$

5. $y - 5 = x + 2$

6. For example, $(R + 3, T + 7)$

7. (i) $\approx \$40$; (ii) ≈ 65 units; (iii) $\approx \$50$; (iv) ≈ 94 units

8. Parallel lines, no solution.

9. T is the time in minutes for Tanya to fertilize the lawn alone; $\frac{1}{T} + \frac{1}{45} = \frac{1}{20}$.

10. **0**

11. $\frac{5}{4}$

DETAILED ANSWERS:

1. Listed above in the BRIEF ANSWERS section are some sample responses. Here is another set of possible answers. (i) $y = Ax - \underline{2}$; (ii) $y = \underline{5}x + A$; (iii) x-intercept A means the point $(A, 0)$ is on the line, so $y - 0 = \underline{7}(x - A)$; (iv) $y - B = \underline{-3}(x - A)$.

2. In the equation editor, X will represent a and Y will represent A. Graph the function as **Y1** in the equation editor. A convenient window to see the part of the graph of interest to us is **Xmin = 0, Xmax = 30, Xscl = 5, Ymin = 0, Ymax = 85, Yscl = 10**. (Note: Part of the choice of these values is knowing we will need $a = 27.41$ and $A = 71.97$ in this problem.) (i) Using 2nd CALC/value with $X = 27.41$ gives $A = 13.7719$. (ii) Place **71.97** into **Y2** and graph. Using 2nd CALC/intersect gives $a = 4.0434$.

3. (i) x-intercept: set $y = 0$ and solve: $2x = 4$, so $x = 2$. (ii) y-intercept: set $x = 0$ and solve: $9y = 4$, so $y = \frac{4}{9}$.

(iii) Put the equation into slope-intercept form by solving for y: $\left\{\begin{array}{l} 2x + 9y = 4 \\ 9y = -2x + 4 \\ y = \frac{-2}{9}x + \frac{4}{9} \end{array}\right\}$. The coefficient of x is the slope: $\frac{-2}{9}$.

4. Let S be the speed I drive in mph and let F be the fuel efficiency in mpg. since the speed I drive determines fuel efficiency, S is the independent (horizontal) variable and F is the dependent (vertical) variable. So, in a (S, F) coordinate system our data becomes $(30, 32)$ and $(54, 26)$. The slope is $m = \frac{26 - 32}{54 - 30} = \frac{-6}{24} = \frac{-1}{4}$. (The units are mpg per mph.) Using $(30, 32)$ in the point-slope form of the equation gives $F - 32 = \frac{-1}{4}(S - 30)$. Had you used $(54, 26)$ instead, the equation would be $F - 26 = \frac{-1}{4}(S - 54)$.

5. Two lines are parallel if they have the same slope. Since the given line is presented to us in slope-intercept form $(y = 1x + 0)$, its slope is seen to be **1**. Thus, the slope of the line we want is also **1**. Using the point-slope form of the equation, we have $y - 5 = 1(x + 2)$.

6. A slope of $\frac{7}{3}$ means that from any point on the line, if you rise **7** units and run **3** units, you get to another point on the line. Hence, $(R+3, T+7)$ is on the line. But there are oodles of other correct responses. For example, since $\frac{7}{3}=\frac{-21}{-9}$, we would have $(R-9, T-21)$ on the line. Also, $\frac{7}{3}=\frac{\frac{7}{3}}{1}$, so $\left(R-1, T-\frac{7}{3}\right)$ is on the line.

7. (i) FC is the cost to make **0** units. But if you make **0** units, the variable cost is **0** and revenue is also **0**. So, in this case Cost = FC and $P=0-C=-C=-FC$. Hence at a **0** production level, $FC=-P$. But at **0** units made, $P\approx -\$40$, so $FC\approx \$40$. (ii) ≈ 65 units. (iii) since $P=R-C$, we have $C=R-P$. At a production level of **50** units, $R\approx \$32$ and $P\approx -\$18$. So $C\approx \$32-(-\$18)=\$50$. (iv) To break even means $P=0$, so ≈ 94 units.

8.
$$\begin{array}{rll} 3\,(1) & -6x+15y=9 & \text{The variables vanish and what is left is} \\ (2) & \underline{6x-15y=1} & \text{nonsens } \Rightarrow \text{ Parallel Lines (No solution)} \\ & 0=10 & \end{array}$$

9. Let T be Tanya's time in minutes to fertilize the lawn alone. Marty takes **45** minutes alone, while working together takes only **20** minutes. So, $\frac{1}{T}+\frac{1}{45}=\frac{1}{20}$.

10. $m=\frac{rise}{run}=\frac{5-5}{-7-3}=\frac{0}{-10}=0$.

11. If $(3,-2)$ lies on the graph of an equation, the coordinates of that point must satisfy the equation. (That is the Fundamental Theorem of Analytic Geometry.) Hence:
$$\left\{\begin{array}{r} 2k(3)+k(-2)=5 \\ 6k-2k=5 \\ 4k=5 \\ k=\frac{5}{4} \end{array}\right\}$$