MATH 100 SOLUTIONS: QUIZ V 11 OCTOBER 2018

(basic calculator permitted)

To obtain any credit, you must show your work for each problem! Place a box around each answer.

1. *[4 pts]* Let P = (7, 11) and Q = (2, -1). Find the *slope* of the line joining P and Q.

Solution: The slope of the line joining the points P and Q is:

$$m_{PQ} = \frac{rise}{run} = \frac{-1-11}{2-7} = \frac{-12}{-5} = \frac{12}{5}$$

2. Albertine buys an old castle in GammaVille. At time t = 0, there are 1593 bats and 4173 rats. Suppose that the bat population grows linearly at a rate of 55 bats per year and that the rat population declines linearly at the rate of 42 rats per year.

(a) *[3 pts]* Write an equation for the number of bats B(t) at time *t*.

Solution: B(t) = 1593 + 55t

(b) *[3 pts]* Write an equation for the number of rats R(t) at time *t*.

Solution: R(t) = 4173 – 42t

3. *[1 pt each]* Consider the straight line y = x – 1. For each of the following points in the plane determine whether
   - the point lies on the line;
   - the point lies above the line, or
   - the point lies below the line.

Write: *ON, ABOVE,* or *BELOW* next to each point below.

(a) (2, 0)

(b) (4.3, 3.3)

(c) (-3, -4)

(d) (1, -2)

Solution: Let's call this function y = f(x).

(a) (2, 0)

*Now f(2) = 2 – 1 = 1 > 0. Thus (2, 0) lies **BELOW** the line.*

(b) (4.3, 3.3)

*Now f(4.3) = 4.3 – 1 = 3.3. Thus (4.3, 3.3) lies **ON** the line.*

(c) (3, 2)

*Now f(3) = 3 – 1 = 2. Thus (3, 2) lies **ON** the line.*

(d) (1, -2)

*Now f(1) = 1 – 1 = 0 > -2. Thus (1, -2) lies **BELOW** the line.*

4. [2 pts each] Which of the following functions might be linear? *Explain.*

(a)

t	**1**	**2**	**3**	**4**	**5**
G(t)	19	15	11	7	3

*Answer: This appears to be a **linear function.***

Explanation: Examining slopes between consecutive points

The slope between (1, 19) and (2, 15) is $\frac{rise}{run} = \frac{15-19}{2-1} = -4$

The slope between (2, 15) and (3, 11) is $\frac{rise}{run} = \frac{11-15}{3-2} = -4$

The slope between (3, 11) and (4, 7) is $\frac{rise}{run} = \frac{7-11}{4-3} = -4$

The slope between (4, 7) and (5, 3) is $\frac{rise}{run} = \frac{3-7}{5-4} = -4$

(b)

x	**0**	**5**	**10**	**15**
F(x)	0	45	90	105

*Answer: **Non-linear***

Explanation: The slope between (0, 0) and (5, 45) is $\frac{rise}{run} = \frac{45-0}{5-0} = 9.$

However, the slope between (10, 90) and (15, 105) is $\frac{rise}{run} = \frac{105-90}{15-10} = \frac{15}{5} = 3$

(c)

x	**0**	**100**	**300**	**600**
g(x)	20	120	320	620

*Answer: This appears to be a **linear function**.*

Explanation: Examining slopes between consecutive points.

The slope between (0, 20) and (100, 120) is $\frac{rise}{run} = \frac{120-20}{100-0} = \frac{100}{100} = 1$

The slope between (100, 120) and (300, 320) is $\frac{rise}{run} = \frac{320-120}{300-100} = \frac{200}{100} = 1$

The slope between (300, 320) and (600, 620) is $\frac{rise}{run} = \frac{600-300}{620-320} = 1$

***Extra credit**: [4 pts]* Consider the three points: A = (1, 3), B = (-1, 2), and C = (4, 5). Can these points lie on the same straight line? Explain!

Solution: We will compute the slope of the line joining A and B; then compute the slope of the line joining B and C.

$$m_{AB} = \frac{rise}{run} = \frac{2-3}{-1-1} = \frac{1}{2}$$

$$m_{BC} = \frac{rise}{run} = \frac{5-2}{4-(-1)} = \frac{3}{5}$$

Since these two slopes are different, the points A, B, C cannot be collinear.

There is a very fine line between loving life and being greedy for it.

– Maya Angelou