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.*

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*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.

1. (2, 0)
2. (4.3, 3.3)
3. (-3, -4)
4. (1, -2)

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

1. (2, 0)

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

1. (4.3, 3.3)

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

1. (3, 2)

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

1. (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.*

1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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* $\frac{rise}{run} =\frac{3-7}{5-4}= -4$

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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