Mathematics 122

Quiz # 1 Name: Key

You must show your work to get full credit.

1. Let p and q be related by

p	3 ①	6 ②	9 ③	15
q	35	30	25	15

(a) Write a sentence or two explaining why this is a linear relationship. Be sure to show all your calculations.

slope at ① $= \frac{\Delta q}{\Delta p} = \frac{30-35}{6-3} = \frac{-5}{3}$

slope at ② $= \frac{\Delta q}{\Delta p} = \frac{25-30}{9-6} = \frac{-5}{3}$

slope at ③ $= \frac{\Delta q}{\Delta p} = \frac{15-25}{15-9} = \frac{-10}{6} = \frac{-5}{3}$

It is linear because the slopes are constants.

(b) Find q as function of p.

$q = -\frac{5}{3}p + 40$

$\frac{\Delta q}{\Delta p} = \frac{q-35}{p-3} = \frac{-5}{3}$

$q - 35 = -\frac{5}{3}(p-3) = -\frac{5}{3}p + 5$

$q = -\frac{5}{3}p + 40$

2. Let P and t be related by

t	0 ①	1	2 ②	3 ③
P	6.0	10.2	17.34	29.478

(a) Write a sentence or two explaining why this is an exponential function.

ratio at ① $= \frac{10.2}{6.0} = 1.7$

ratio at ② $= \frac{17.34}{10.2} = 1.7$

ratio at ③ $= 1.7$

It is exponential because the ratio is constant

(b) Find P as a function of t.

$P = 6(1.7)^t$

$P(t) = P_0 a^t$

where $P_0 = P(0) = 6$

$a =$ ratio $= 1.7$

3. Solve $3(1.2)^t = 19$ for t.

$t = 10.124$

$(1.2)^t = 19/3$

$t \ln(1.2) = \ln(19/3)$

$t = \ln(19/3)/\ln(1.2) = 10.124$