MHF 4U **Quiz 2.1-2.5** $\frac{}{19} + \frac{}{1}$ Name: Solutions

1. Average Rate of Change = slope of secant

[1] Instantaneous Rate of Change= slope of tangent

2. The population of a colony of rats is changing according to the model $P(t) = 5t^2 - 4t + 7$, where t is measured in minutes. Determine the average rate of change of population during the first 10 minutes. [3]

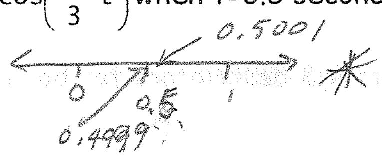
$$ARoC = \frac{\Delta P}{\Delta t}$$

$$= \frac{[5(10)^2 - 4(10) + 7] - [5(0)^2 - 4(0) + 7]}{10 - 0}$$

$$= 46$$

$\therefore$ average rate of change is 46 rats/min at 10 min

3. Estimate the instantaneous rate of change for the function $f(t) = 50 - 20\cos\left(\frac{8\pi}{3}t\right)$ when t=0.5 seconds using the preceding and following method. [3]



$$\Delta f = f(0.5001) - f(0.5)$$

$$\frac{\Delta f}{\Delta t} = \frac{\left[50 - 20\cos\left(\frac{8\pi}{3}(0.5001)\right)\right] - \left[50 - 20\cos\left(\frac{8\pi}{3}\right)(0.5)\right]}{0.5001 - 0.5}$$

$$= -145.14$$

$$\Delta f = f(0.5) - f(0.4999)$$

$$\frac{\Delta f}{\Delta t} = \frac{\left[50 - 20\cos\left(\frac{8\pi}{3}(0.5)\right)\right] - \left[50 - 20\cos\left(\frac{8\pi}{3}(0.4999)\right)\right]}{0.5 - 0.4999}$$

$$= -145.07$$

$$IRoC = \frac{-145.14 + (-145.07)}{2}$$

$$= -145.1$$

the IRoC is -145.01

4. Estimate the instantaneous rate of change for the function $f(x) = \frac{3x - 1}{x^2}$ when x= 4. Use the difference quotient method. [3]

$a = 4$, $h = 0.0001$ *

0.49	0.5	0.51
0.499	0.5	0.501
0.4999	0.5	0.5001

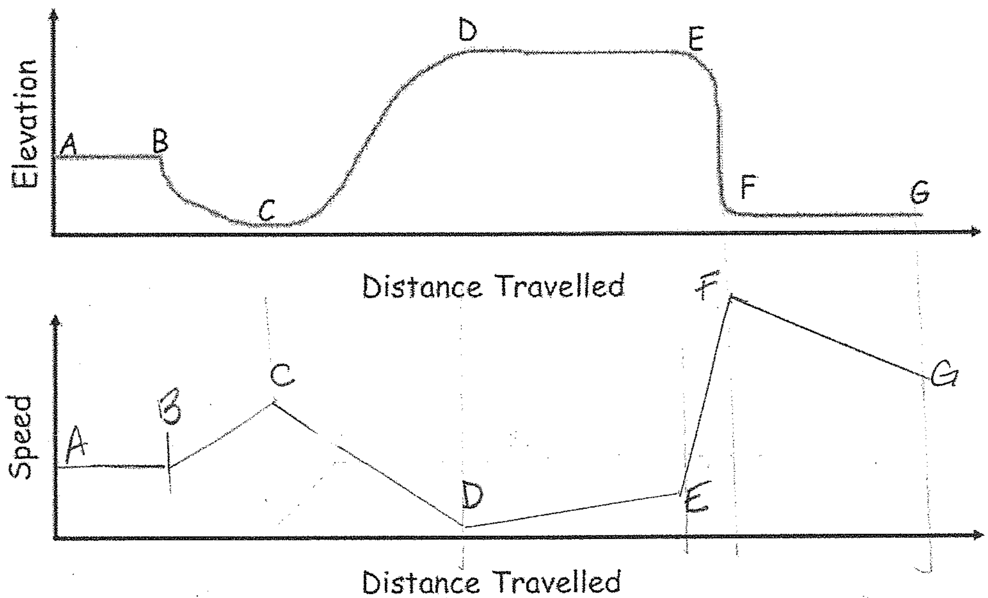
$$IRoC = \frac{f(a+h) - f(a)}{h}$$

$$= \frac{\left[\frac{3(4.0001) - 1}{(4.0001)^2}\right] - \left[\frac{3(4) - 1}{(4)^2}\right]}{0.0001}$$

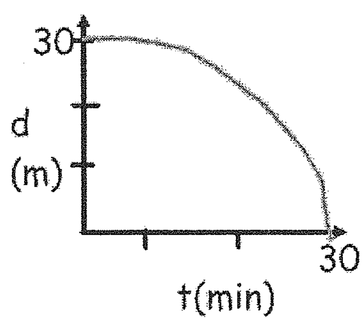
$$\doteq -0.156$$

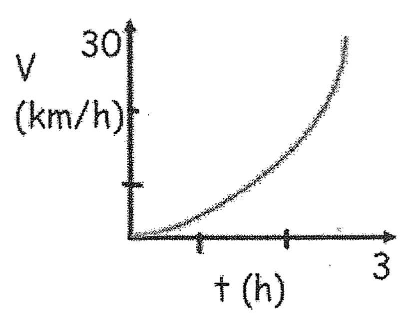
$\therefore$ the instantaneous rate of change is -0.156

5. The picture shows the elevation of a cross-country ski trail. Sketch a graph of the possible speed of a skier versus the distance traveled along the trail. [3]



6. Describe the following graphs. Use at least 3 descriptors for both. [3]





negative tangent slopes = negative velocity

slopes of tangents getting smaller (more negative) = negative acceleration = C.D.

$a \cdot v > 0$ = speeding up = slopes of tangents getting steeper

positive displacement = above x-axis

moving towards the origin

positive tangent slopes = positive accelerat

slopes of tangents increasing = accelera increasi

positive velocity = above x axis

$a \cdot v > 0$ = speeding up = slopes of tangents g