

MCV4U Aug 21, 2009  
Quiz #1 Introduction to Calculus

Name .....

1. Rationalize the denominator:  $\frac{\sqrt{3}}{5-3\sqrt{2}} = E$

[K/U 2 marks]

$$\begin{aligned} & \frac{\sqrt{3}}{5-3\sqrt{2}} \cdot \frac{5+3\sqrt{2}}{5+3\sqrt{2}} \\ &= \frac{\sqrt{3}(5+3\sqrt{2})}{25-18} \\ \therefore E &= \frac{\sqrt{3}(5+3\sqrt{2})}{7} \quad \text{or} \quad \frac{5\sqrt{3}+3\sqrt{6}}{7} \end{aligned}$$

2. Consider the following position function:  $s(t) = \frac{t^2}{t+1}$ .

[K/U 3 marks]

Find the average velocity over the time interval [2,4].

$$t_1 = 2 \quad s_1 = s(2) = \frac{2^2}{2+1} = \frac{4}{3}$$

$$t_2 = 4 \quad s_2 = s(4) = \frac{4^2}{4+1} = \frac{16}{5}$$

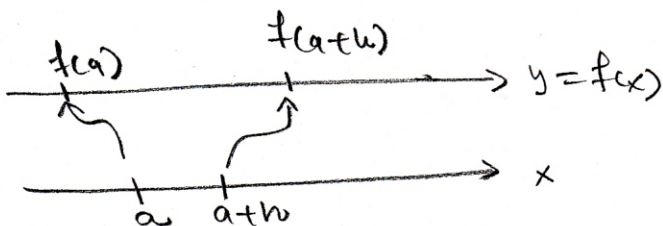
$$\begin{aligned} AV &= \frac{s(t_2) - s(t_1)}{t_2 - t_1} \\ &= \frac{\frac{16}{5} - \frac{4}{3}}{4 - 2} \\ &= \frac{48 - 20}{15(2)} \end{aligned}$$

$$\therefore AV = \frac{14}{15} \quad \text{m/s}$$

3. Find the instantaneous rate of change in the  $y$  variable with respect to  $x$  for the function

$$y = f(x) = \sqrt{2x-3} \text{ at the generic number } x = a.$$

[A 5 marks]



$$IRC = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\sqrt{2(a+h)-3} - \sqrt{2a-3}}{h} \cdot \frac{\sqrt{2(a+h)-3} + \sqrt{2a-3}}{\sqrt{2(a+h)-3} + \sqrt{2a-3}}$$

$$= \lim_{h \rightarrow 0} \frac{2(a+h) - 3 - (2a - 3)}{h (\sqrt{2(a+h)-3} + \sqrt{2a-3})}$$

$$= \lim_{h \rightarrow 0} \frac{2h}{h (\sqrt{2(a+h)-3} + \sqrt{2a-3})}$$

$$= \frac{2}{\sqrt{2a-3} + \sqrt{2a-3}}$$

$$IRC = \frac{1}{\sqrt{2a-3}}$$

$\therefore$  The IRC at  $x = a$  is  $IRC = \frac{1}{\sqrt{2a-3}}$