

Quiz 9

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §3.6 #42 (3 marks) Suppose the quantity x of Super Titan radial tires made available each week in the marketplace is related to the unit-selling price by the equation

$$p - \frac{1}{2}x^2 = 48$$

where x is measured in units of a thousand and p is in dollars. How fast is the weekly supply of Super Titan radial tires being introduced into the marketplace when $x = 6$, $p = 66$, and the price/tire is decreasing at the rate of \$ 3/week?

$$\frac{d}{dt} \left[p - \frac{1}{2}x^2 \right] = \frac{d}{dt} [48]$$

$$\therefore @ (x, p) = (6, 66), \frac{dp}{dt} = -3$$

$$\frac{dp}{dt} - x \frac{dx}{dt} = 0$$

$$\frac{dx}{dt} = \frac{-3}{6} = -\frac{1}{2}$$

$$\frac{dp}{dt} = x \frac{dx}{dt}$$

\therefore supply is decreasing at 500 units a week

$$\frac{dp/dt}{x} = \frac{dx}{dt}$$

Question 2. §3.7 #13 (3 marks) Find the differential of the function:

$$f(x) = \sqrt{3x^2 - x}$$

So $dy = f'(x) dx$

$$\therefore dy = \left(\frac{6x-1}{2\sqrt{3x^2-x}} \right) dx$$

and $f'(x) = \frac{1}{2\sqrt{3x^2-x}} \cdot (6x-1)$

Question 3. §3.4 #35 (4 marks) Find the interval(s) where the function is increasing and the interval(s) where it is decreasing.

$$f(x) = \frac{x^2-1}{x}$$

$$\begin{aligned} f'(x) &= \frac{2x(x) - (x^2-1)(1)}{x^2} \\ &= \frac{2x^2 - x^2 + 1}{x^2} \\ &= \frac{x^2+1}{x^2} \end{aligned}$$

	$(-\infty, 0)$	$(0, \infty)$
p	-1	1
$f'(p)$	2	2
inc/dec	↗	↗

\therefore critical point at $x=0$

\therefore Domain $f(x)$: $(-\infty, 0) \cup (0, \infty)$