

MTH U131 Quiz 3 Review

1. Let  $f(x) = 3 - 4x - 2x^2$ .

a) Find the average rate of change of  $f(x)$  between the points  $(x, f(x))$  and  $(x+h, f(x+h))$ . Show all your algebra and simplify your answer.

$$\begin{aligned} \frac{f(x+h) - f(x)}{(x+h) - x} &= \frac{1}{h} \left[ (3 - 4(x+h) - 2(x+h)^2) - (3 - 4x - 2x^2) \right] \\ &= \frac{1}{h} \left[ 3 - 4x - 4h - 2x^2 - 4xh - 2h^2 - 3 + 4x + 2x^2 \right] \\ &= \frac{1}{h} (-4h - 4xh - 2h^2) = -4 - 4x - 2h \end{aligned}$$

b) Use your answer to part (a) and the limit definition of  $f'(x)$  to find  $f'(x)$ . Do not use any special derivative formulas.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} (-4 - 4x - 2h) = -4 - 4x$$

2. Find the derivatives of the following functions.

(a)  $h(x) = 10^3 - 25x^6 + 3x^{15}$

$$h'(x) = -6(25)x^5 + 15(3)x^{14} = -150x^5 + 45x^{14}$$

(b)  $g(t) = 8\sqrt{t^5} - 6.78e^t = 8t^{5/2} - 6.78e^t$

$$g'(t) = 8\left(\frac{5}{2}\right)t^{3/2} - 6.78e^t = 20t^{3/2} - 6.78e^t$$

(c)  $k(x) = 4.96(17.2)^x - 5.7 \ln(x)$

$$k'(x) = 4.96(17.2)^x \ln(17.2) - \frac{5.7}{x}$$

(d)  $p(s) = \frac{7}{6s^2} - 5s^{-1.2} + e^3 = \frac{7}{6}s^{-2} - 5s^{-1.2} + e^3$

$$p'(s) = (-2)\left(\frac{7}{6}\right)s^{-3} - 5(-1.2)s^{-2.2} + 0 = -\frac{7}{3s^3} + \frac{6}{s^{2.2}}$$

(e) Circle the number of the correct answer for the derivative of  $f(x) = 12(\sqrt[3]{x^5}) - \frac{9}{x} = 12x^{5/3} - 9x^{-1}$

(i)  $7.2x^{-2/5} + 9x^{-2}$

(ii)  $20x^{2/3} - 9$

(iii)  $20x^{2/3} - 9x^{-2}$

(iv)  $7.2x^{-2/5} - 9$

(v) None of the above

$$f'(x) = 12\left(\frac{5}{3}\right)x^{2/3} - 9(-1)x^{-2} = 20x^{2/3} + 9/x^2$$

