Quiz 4
TQS 211

Key

You are welcome to use any written homework from Chapter 3, worksheets you completed, and a calculator but no books or class notes. Show *all* your work (algebraically or geometrically) for each and simplify. No credit is given without supporting work.

1. Find the derivative of the following functions:

(a) [4] $\alpha(t) = -2t^2 + \dfrac{6}{\sqrt{t}} - \dfrac{1}{t^3}$ $= -2t^2 + 6t^{-1/2} - t^{-3}$

dist/precalc (+1)

over scalars (+1)

over addition (.5)

$$\alpha'(t) = (-2t^2)' + (6t^{-1/2})' - (t^{-3})'$$
$$= -2(t^2)' + 6(t^{-1/2})' - (-3)t^{-4}$$
$$= -2 \cdot 2t + 6 \cdot -\tfrac{1}{2}t^{-3/2} + 3t^{-4}$$
$$= -4t - 3t^{-3/2} + 3t^{-4} \quad \boxed{+1.5}$$

(b) [4] $\beta(x) = \sqrt{x}(x^3 + x^{\frac{1}{2}})$ $= x^{1/2}(x^3 + x^{1/2}) = x^{1/2}x^3 + x^{1/2}x^{1/2} = x^{7/2} + x$

dist/precalc (+1)

over addition (+1)

$$\beta'(x) = (x^{7/2})' + (x)'$$
$$= \tfrac{7}{2}x^{5/2} + 1$$

$\boxed{+1}$ power $\boxed{+1}$ power

(c) [3] $\gamma(y) = 2^y + y^2 - 2$

$$\gamma'(y) = (2^y)' + (y^2)' - (2)'$$
$$= 2^y \ln 2 + 2y + 0$$

$\boxed{.5}$ $\boxed{.5}$ $\boxed{+1}$ $\boxed{+.5}$

sum $\boxed{.5}$

(d) [3] $\delta(x) = 7\ln x + \pi e^x$

$$\delta'(x) = (7\ln x)' + (\pi e^x)'$$
$$= 7(\ln x)' + \pi (e^x)'$$
$$= 7 \cdot \frac{1}{x} + \pi \cdot e^x$$

2. The cost function of a company is unknown but increasing production from 100 units to 101 units increased costs from \$1500 to \$1550.

(a) [1] Estimate the marginal cost at 100 units.

$$1550 - 1500 = \$50$$

(b) [3] Find the linear function that will approximate the cost function for values near 100, that is, find the equation for the line tangent to the Cost function at 100.

$y = mx + b$

$m = 50$

passes through $(100, 1500)$

So $\quad 1500 = 50 \cdot 100 + b$

$b = 1500 - 5000 = -3500$

So

$y = 50x - 3500$

(c) [2] Use (b) to estimate the cost of producing 118 units.

Cost at $118 \approx 50(118) - 3500$

$5900 - 3500 = \$2400$

$$\begin{array}{r} \overset{4}{118} \\ \underline{50} \\ 5900 \end{array}$$