Mathematics 122

Quiz 12 Name: Key

You must show your work to get full credit.

1. Some of the values of a function $f(x)$ are given by the following table.

x	0	10	20	30	40
$f(x)$	5	6	8	11	15

(a) Fill in the following table for the estimates of the derivative.

x	5	15	25	35
$f'(x)$	.1	.2	.3	.4

$\frac{6-5}{10-0}=.1$ $\frac{8-6}{20-10}=.2$ $\frac{11-8}{30-20}=.3$ $\frac{15-11}{40-30}=.4$

(b) Is the second derivative positive, negative, or does in change sign? Write a sentence or two to explain you answer. The first derivative, $f'(x)$, is increasing so $f''>0$. Thus the second derivative is positive.

2. Compute the following derivatives. Here a and b are constants.

(a) $y = 3x^4 - 2x^3 - 9$ $\quad \frac{dy}{dx} = 12x^3 - 6x^2$

(b) $A(r) = 3r + \frac{4}{r^2} = 3r + 4r^{-2}$
$A'(r) = 3 - 8r^{-3}$ $\quad A'(r) = 3 - 8r^{-3}$ $= 3 - \frac{8}{r^3}$

(c) $w = a\sqrt{z} + \pi z^2 = az^{\frac{1}{2}} + \pi z^2$
$\frac{dw}{dz} = \frac{1}{2}az^{-\frac{1}{2}} + 2\pi z$ $\quad \frac{dw}{dz} = \frac{1}{2}az^{-\frac{1}{2}} + 2\pi z$

(d) $f(t) = a^2 + t(t+1) = a^2 + t^2 + t$ $\quad f'(t) = 2t + 1$
$(a^2)' = 0$ as a is constant

(e) If $f(x) = \frac{1}{x^2}$ what is $f'(2)$ $\quad f'(2) = -\frac{1}{4} = -.25$
$f(x) = x^{-2}$
$f'(x) = -2x^{-3}$ $\quad f'(2) = -2(2)^{-3} = \frac{-2}{2^3} = \frac{-2}{8} = -\frac{1}{4}$

3. Find the section derivative of $f(x) = x^2 + \frac{1}{x}$. $\quad f''(x) = 2 + 2x^{-3} = 2 + \frac{2}{x^3}$
$f(x) = x^2 + x^{-1}$
$f'(x) = 2x - x^{-2}$ $\quad f''(x) = 2 + 2x^{-3}$