Homework 15

6) $y = \sqrt{x-4}$ 5 to 5.2 dy Δy

$dy = \frac{1}{2}(x-4)^{-\frac{1}{2}}\,dx$

$dy = \frac{1}{2}(5-4)^{-\frac{1}{2}}(0.2)$

$dy = \frac{1}{2}\cdot 1(0.2)$

$dy = 0.1$

$\Delta y = f(5.2) - f(5)$

$\Delta y = \sqrt{5.2-4} - \sqrt{5-4}$

$\Delta y = \sqrt{1.2} - \sqrt{1}$

$\Delta y = \sqrt{1.2} - 1$

7) $f(x) = \sqrt{x+3}$ L.A. @ $a = 22$

$f'(x) = \frac{1}{2}(x+3)^{-\frac{1}{2}}$

$f'(22) = \frac{1}{2}(22+3)^{-\frac{1}{2}}$

$= \frac{1}{2}(25)^{-\frac{1}{2}}$

$= \frac{1}{2}\cdot\frac{1}{5} = \frac{1}{10}$

$f(22) = \sqrt{22+3} = 5$

$L(x) = f'(22)(x-22) + f(22)$

$L(x) \approx \frac{1}{10}(x-22) + 5$

$\sqrt{24.9} = \sqrt{x+3}$

$24.9 = x+3$

$x = 21.9$

$L(21.9) = \frac{1}{10}(21.9-22) + 5$

$L(21.9) = \frac{1}{10}(-0.1) + 5$

$L(21.9) = -0.01 + 5 = 4.99$

$\sqrt{25.01} = \sqrt{x+3}$

$25.01 = x+3$

$x = 22.01$

$L(22.01) = \frac{1}{10}(22.01-22) + 5$

$L(22.01) = \frac{1}{10}(0.01) + 5$

$= 0.001 + 5$

$= 5.001$

3) $y = 4x^2$

$-1$ to $-1.1$

$dy = f'(x)\,dx$

$dy = 8x\,dx$

$dy = 8(-1)(-0.1)$

$dy = -8(-0.1)$

$= 0.8$

9) $f(x) = e^x$ $\quad a = 0$ $\quad e^{0.2} \approx ?$

$L(x) = f(a) + f'(a)(x-a)$

$f(0) = e^0 = 1$

$f'(x) = e^x$

$f'(0) = 1$

$L(x) = 1 + 1(x-0)$

$= 1 + x$

$L(0.2) = 1 + 0.2 = 1.2$

## Homework 16

4) $f(x) = \frac{1}{3}x^3 - \frac{5}{2}x^2 + 4x + 18$

$f'(x) = x^2 - 5x + 4$

$0 = x^2 - 5x + 4$

$0 = (x-4)(x-1)$

$x = 1, 4$

critical #s

8) $f(x) = \frac{\ln x}{x}$ $[1, 3]$

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

$0 = 1 - \ln x$

$\ln x = 1$

$x = e$

$f(1) = \frac{\ln 1}{1} = 0$ ← abs min

$f(e) = \frac{\ln e}{e} = \frac{1}{e}$ ← abs max

$f(3) = \frac{\ln 3}{3}$