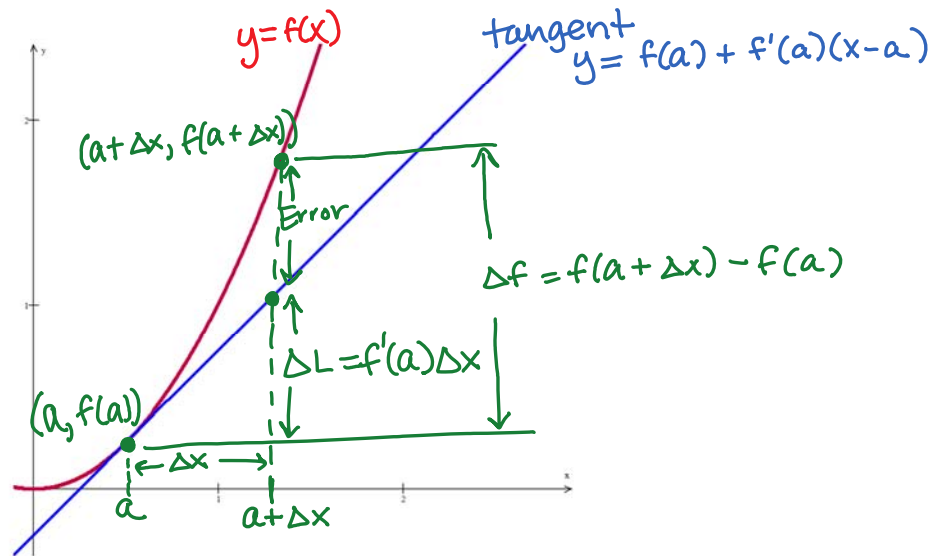


5.5 Day 3 Notes

Monday, November 28, 2016 11:35 AM

df df df df df df df

5.5 Differentials/Estimating Change



$$\Delta f = f(a + \Delta x) - f(a) = \text{True Change}$$

$$\Delta L = f'(a)\Delta x = \text{Estimated Change}$$

$$(df = f'(a)dx)$$

$$|\Delta f - \Delta L| = \text{approximation Error}$$

1. The function $f(x) = x^2 + 2x$ changes values when x changes from a to $a + dx$. If $a = 0$, $dx = 0.1$, find:

- a) the true change $\Delta f = f(0 + 0.1) - f(0) = .21$
- b) the estimated change $\Delta L = f'(0) \cdot .1 = (2(0) + 2) \cdot .1 = .2$
- c) the approximation error $\text{Error} = |.21 - .2| = .01$ Error less than 10^{-1}

$$r = 4 \quad dr = 0.1$$

2. The radius of a circle changes from 4 inches to 4.1 inches. Estimate the increase to the circle's area using dA . Then compare dA to the true change ΔA , and find the approximation error.

$$A = \pi r^2$$

$$\text{True Change: } \Delta A = \pi (4.1)^2 - \pi (4)^2 = 2.545 \text{ in}^2$$

$$\text{Estimated Change: } \frac{dA}{dr} = 2\pi r$$

True change: $\Delta A = \pi(4.1) - \pi(4) = 2.540 \text{ in}^2$

Estimated Change: $\frac{dA}{dr} = 2\pi r$

$$dA = 2\pi r dr$$

$$dA = 2\pi(4)(0.1) = 2.513 \text{ in}^2$$

Approx. Error = $|\Delta A - dA| \approx .031 \text{ in}^2$ less than 10^{-1} in^2