4.5

$\sqrt{7} \approx 2.646$

$f(x) = \sqrt{x}$ (9,3)

$f'(x) = \frac{1}{2\sqrt{x}}$

$f'(9) = \frac{1}{2\sqrt{9}} = \frac{1}{6}$

* $y - 3 = \frac{1}{6}(x-9)$

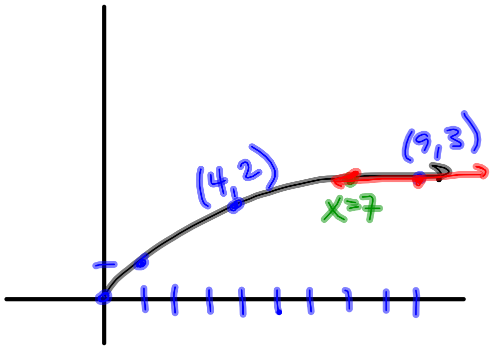
if $x = 7$

$y - 3 = \frac{1}{6}(7-9)$

$y - 3 = -\frac{1}{3}$

$+3 \quad +3$

$y = 2\frac{2}{3}$



Dec 8-11:27 AM

Linearization of f at a:

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

$\sqrt{110} \approx 10.488$

$f(x) = \sqrt{x}$ when $a = 100$

x	y
100	10

$f'(x) = \frac{1}{2\sqrt{x}}$

$f'(100) = \frac{1}{2\sqrt{100}} = \frac{1}{20}$

$L(x) = \frac{1}{20}(x-100) + 10$

$L(110) = \frac{1}{20}(110-100) + 10 = 10.5$

Dec 8-12:28 PM

P242 #3

$f(x) = x + \frac{1}{x}$, $a = 1$ $f(1) = 1 + \frac{1}{1} = 2$

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

$f'(1) = 1 - \frac{1}{1^2} = 0$

$L(x) = 0(x-1) + \underline{2}$

$L(x) = 2$

Dec 8-12:34 PM

Differentials

$y = x^2$ $\cancel{dx}\frac{dy}{\cancel{dx}} = 2x\,dx$ $dy = 2x\,dx$

1. $y = \frac{x}{x^2-1}$, $x=3$, $dx = .01$

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

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

$dy = \frac{-x^2-1}{(x^2-1)^2}dx \Big|_{x=3,\, dx=.01}$

$dy = \frac{-3^2-1}{(3^2-1)^2}(.01) = -.0015625$

Dec 8-12:36 PM

2. $y = x\sqrt{(x-1)}$ $x=2$ $dx = .005$

$$\frac{dy}{dx} = x\left(\frac{1}{2\sqrt{x-1}}\cdot 1\right) + \sqrt{x-1}\cdot 1$$

$$dx\,\cancel{\frac{dy}{dx}} = \left(\frac{x}{2\sqrt{x-1}} + \sqrt{x-1}\right)dx$$

$$dy = \left(\frac{x}{2\sqrt{x-1}} + \sqrt{x-1}\right)dx \Big|_{x=2,\ dx=.005}$$

$$dy = \left(\frac{2}{2\sqrt{2-1}} + \sqrt{2-1}\right)(.005) = .01$$

Dec 8-12:46 PM

Antiderivatives

$f'(x) = 2x+4$

$f(x) = x^2 + 4x \underline{\underline{+C}}$

How do we know?

CHECK! (take deriv. of $f(x)$)

Dec 8-12:48 PM

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

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

$= \frac{1}{3}x^3 - x^2 + C$

4. $f'(x) = \sec^2 x$

$f(x) = \tan x + C$

5. $f'(x) = \frac{1}{(x+6)}, \; x > -6$

$f(x) = \ln(x+6) + C$

Dec 8-12:55 PM

$f'(x) = 2x + 4$

$f(x) = x^2 + 4x + C$

we need an x $ y value!

$(3, 2)$

$2 = 9 + 12 + c$

$c = -19$

$f(x) = x^2 + 4x - 19$

Dec 8-12:58 PM

6. $f'(x) = \underline{3}x$ $P(1,5)$

$f(x) = \frac{3}{2}x^2 + C$

$5 = \frac{3}{2}(1)^2 + C$

$-\frac{3}{2} \quad -\frac{3}{2}$

$C = \frac{7}{2}$

$f(x) = \frac{3}{2}x^2 + \frac{7}{2}$

Dec 8-1:02 PM

7. $f'(x) = \frac{1}{3x^{\frac{2}{3}}}$ $P(8,3)$

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

$f(x) = \frac{\frac{1}{3}}{\frac{1}{3}}x^{\frac{1}{3}} = x^{\frac{1}{3}} + C$

$3 = 8^{\frac{1}{3}} + C$

$3 = 2 + C$

$C = 1$

$f(x) = \sqrt[3]{x} + 1$

Dec 8-1:09 PM

8. $f'(x) = x^2 + 2 + \sin x \quad P(0,5)$

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

$5 = \cancel{\frac{1}{3}(0)^3} + \cancel{2(0)} - \cos 0 + C$

$5 = -1 + C$

$C = 6$

$f(x) = \frac{1}{3}x^3 + 2x - \cos x + 6$

Dec 8-1:11 PM