3.1 #7

$f(x)=\sqrt{x+1}$ at $a=3$

$$\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$$

$(x,\sqrt{x+1})(a,\sqrt{a+1})$

$$\lim_{x\to a}\frac{(\sqrt{x+1}-\sqrt{a+1})}{(x-a)}\cdot\frac{(\sqrt{x+1}+\sqrt{a+1})}{(\sqrt{x+1}+\sqrt{a+1})}$$

$$\lim_{x\to a}\frac{x+1-(a+1)}{(x-a)(\sqrt{x+1}+\sqrt{a+1})} \qquad x+1-a-1$$

$$\lim_{x\to a}\frac{x-a}{(x-a)(\sqrt{x+1}+\sqrt{a+1})}$$

$$\lim_{x\to a}\frac{1}{\sqrt{x+1}+\sqrt{a+1}}=\frac{1}{\sqrt{a+1}+\sqrt{a+1}}$$

$$=\frac{1}{2\sqrt{a+1}} \quad \text{at } a=3$$

$$\frac{1}{2\sqrt{4}}=\boxed{\frac{1}{4}}$$

3.3 #25

$y=x^2+5x$ at $x=3$

$y'=2x+5$

$y=3^2+5(3)$
$=24$

$y'(3)=2(3)+5$
$=11$

equation for line

$(3,24)$ $m=11$

$$\boxed{y-24=11(x-3)}$$

3.2 #31

$$f(x) = \frac{x^3 - 8}{x^2 - 4x - 5}$$

$$(x - 5)(x + 1)$$

$x = 5$ $x = -1$ not differentiable (discontinuous)

Is differentiable

$(-\infty, -1) \cup (-1, 5) \cup (5, \infty)$

3.3 #5

$$y = \frac{x^3}{3} + \frac{x^2}{2} + x$$

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

$$\frac{dy}{dx} = x^2 + x + 1$$

3.3 #13

$$y = (x+1)(x^2+1)$$

$$y = u \cdot v$$

$$\frac{dy}{dx} = u \cdot v' + v u'$$

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

$$\frac{dy}{dx} = 2x^2 + 2x + x^2 + 1$$

$$= 3x^2 + 2x + 1$$

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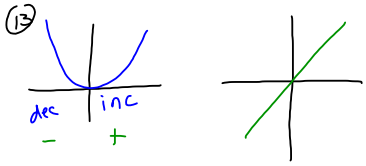

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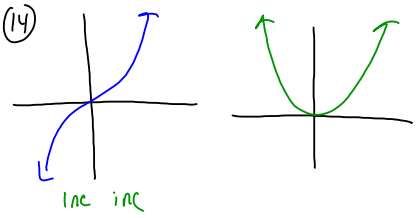

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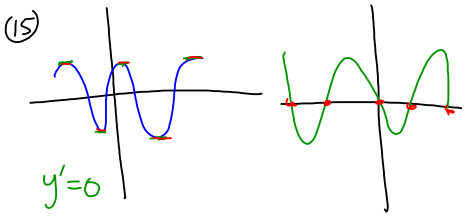

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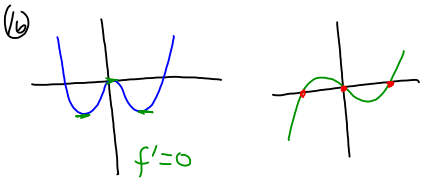

3.3 # 17

$y = \frac{u}{v}$

$\frac{dy}{dx} = \frac{v(u') - u(v')}{v^2}$

$y = \frac{2x+5}{3x-2}$

$\frac{dy}{dx} = \frac{(3x-2)2 - (2x+5)(3)}{(3x-2)^2}$ $\quad -3(2x+5)$

$\frac{dy}{dx} = \frac{6x-4-6x-15}{(3x-2)^2}$

$\frac{dy}{dx} = -\frac{19}{(3x-2)^2}$

3.3 #7

$y = x^3 - 2x^2 + x + 1$ at $x =$

$y' = 3x^2 - 4x + 1$

$(3x-1)(x-1) = 0$

$3x = 1$

$x = \frac{1}{3}$ $x = 1$

3.3 #23

$u = 5 \quad u' = -3 \quad v = -1 \quad v' = 2$

a) $\frac{d}{dx}(uv) = uv' + vu'$

$= (5)(2) + (-1)(-3)$

$= 13$

3.3 #23

$u = 5 \quad u' = -3 \quad v = -1 \quad v' = 2$

$\frac{d}{dx}\left(\frac{v}{u}\right) = \frac{u \cdot v' - v u'}{u^2}$

$= \frac{(5)(2) - (-1)(-3)}{25}$

$= \frac{10 - 3}{25}$

$= \frac{7}{25}$

d) $\frac{d}{dx}(7v - 2u)$

$7v' - 2u'$

3.3 #33

$$y = x^4 + x^3 - 2x^2 + x - 5$$

$$y' = 4x^3 + 3x^2 - 4x + 1$$

$$y'' = 12x^2 + 6x - 4$$

$$y''' = 24x + 6$$

$$y^{iv} = 24$$

3.3 (37)

$\perp$

$y = x^3 - 3x + 1$ at $(2,3)$

$m = -\frac{1}{9}$

$y' = 3x^2 - 3$

$y'(2) = 3(2)^2 - 3$

$= 9$ slope of tangent

$$\boxed{y - 3 = -\frac{1}{9}(x - 2)}$$