Sec 3.1

1a.) $\lim\limits_{x\to 0} \dfrac{(2x^2-3x)-(0)}{x-0}$

$\lim\limits_{x\to 0} \dfrac{\cancel{x}(2x-3)}{\cancel{x}}$

$= 2(0)$
$= 0$

b.) $\lim\limits_{x\to 4} \dfrac{\sqrt{2x+1}-3}{(x-4)} \cdot \dfrac{(\sqrt{2x+1})+3}{(\sqrt{2x+1}+3)}$

$\lim\limits_{x\to 4} \dfrac{\cancel{(2x+1)-9}\ \ \cancel{2x-8}\ \ 2\cancel{(x-4)}}{\cancel{(x-4)}(\sqrt{2x+1}+3)}$

$= \dfrac{2}{\sqrt{2(4)+1}+3}$

$= \dfrac{2}{3+3} = \dfrac{2}{6} = \dfrac{1}{3}$

~~c.) lim x→3 (1/(x−2) − 1)/(x−3); lim x→3 ((1−(x−2))/(x−2))/(x−3); lim x→3 ((1−x+2)/(x−2))/(x−3); lim x→2 (−x+3)~~ IGNORE

1c.) $\lim\limits_{x\to 3} \dfrac{\frac{1}{x-2}-1}{x-3}$

$\lim\limits_{x\to 3} \dfrac{\frac{1-(x-2)}{x-2}}{x-3}$

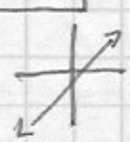
$\lim\limits_{x\to 3} \dfrac{\frac{1-x+2}{x-2}}{x-3}$

$\lim\limits_{x\to 3} \dfrac{-x+3}{(x-3)(x-2)}$

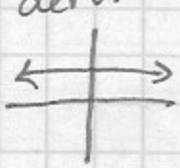
$\lim\limits_{x\to 3} \dfrac{-\cancel{(x-3)}}{\cancel{(x-3)}(x-2)}$

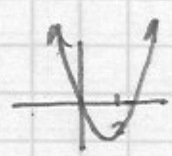
$= \dfrac{-1}{3-2} = -1$

3.2

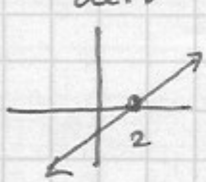
2. 

derv.



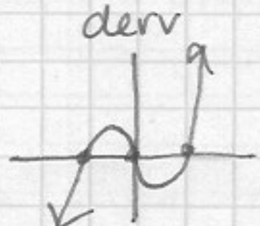
3. 

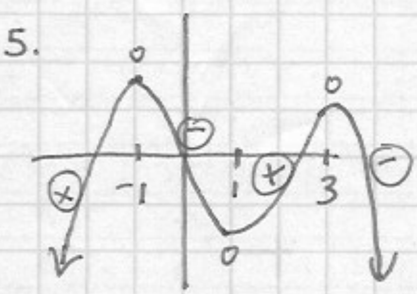
derv



4. 

derv



5. 

(6) $f(x) = \begin{cases} 5x^2+7, & x<1 \\ 10x+5, & x \geq 1 \end{cases}$

cont?
$5(1)^2+7 = 10(1)+5$
$12 \neq 15$
Not cont! so not Diff.!

(7) $f(x) = \begin{cases} ax^2+10, & x<1 \\ x^2-6x+b, & x \geq 1 \end{cases}$

cont
$a+10 = 1-6+b$
$a+10 = -5+b$
$a+15 = b$

diff
$2a = 2-6$
$2a = -4$
$a = -2$

$-2+15 = b$
$13 = b$

Sec 3.3

(8) $f'(x) = 12x^3 - 10x$

(7) $f'(x) = -3e^{-3x} + 30x^5 - \frac{1}{2\sqrt{x}}$

(9) $g'(x) = \frac{45}{2\sqrt{x}} + 10x + \frac{15}{x^4}$

(10) $f'(x) = 48x^3 - 15x^2 + 6x$
$f'(-2) = 48(-2)^3 - 15(-2) + 6(-2)$
$= -366$

(11) $f(4) = 4^3 + 7(4) - 10$
$f(4) = 82$
$f'(x) = 3x^2 + 7$
$f'(4) = 3(4)^2 + 7$
$f'(4) = 55$

$y = \underline{55}(x - \underline{4}) + \underline{82}$

(12) horizontal tangent means $f'(x) = 0$

$0 = 3x^2 + 24x - 15$
$0 = 0(x^2 + 8x - 5)$

$x = \frac{-8 \pm \sqrt{64 - 4(1)(-5)}}{2(1)}$

$x = .5825 \quad x = -8.5825$

(13) $h(x) = 5f(x) - 12g(x)$
$h(3) = 5f(3) - 12g(3)$
$= 5(10) - 12(-1)$
$= 62$
$(3, 62)$

$h'(x) = 5f'(x) - 12g'(x)$
$h'(3) = 5(f'(3)) - 12g'(3)$
$= 5(-5) - 12(3)$
$= -25 - 36$
$= -61$

$y = -61(x-3) + 62$

$\boxed{3.4}$

(14) $f(x) = (x^2 - 2x)(x-5)$

$f(x) = x^3 - 5x^2 - 2x^2 + 10x$ or

$f(x) = x^3 - 7x^2 + 10x$

$f'(x) = 3x^2 - 14x + 10$

$f'(x) = (2x-2)(x-5) + (x^2-2x)(1)$

$= 2x^2 - 10x - 2x + 10 + x^2 - 2x$

$= 3x^2 - 14x + 10$

(15) $y' = (6x)(e^{4x}) + (3x^2)(4e^{4x})$

$y' = 6x e^{4x} + 12x^2 e^{4x}$

$y' = 6xe^{4x}(1 + 2x)$

(16) $g'(x) = \dfrac{(9x^2 - \frac{1}{2\sqrt{x}})(x^3-1) - (3x^3 - \sqrt{x})(3x^2)}{(x^3-1)^2}$

(17) $f'(x) = e^x(3x-1) + e^x(3)$

$f'(0) = e^0(3(0)-1) + e^0(3)$

$= -1 + 3$

$f'(0) = 2$

(18) $f'(x) = \frac{\cancel{2}}{\cancel{2}\sqrt{x}}(2x^3-5) + 2\sqrt{x}(6x^2)$

$f'(4) = \frac{1}{\sqrt{4}}((2(4)^3-5) + (2\sqrt{4})(6(4)^2)$

$f'(4) = 253.5$

(20) $p(x) = f(x)g(x)$

$p'(x) = f'(x)g(x) + f(x)g'(x)$

$p'(2) = f'(2)g(2) + f(2)g'(2)$

$p'(2) = (-2)(3) + (-5)(6)$

$= -6 - 30$

$= -36$

$q(x) = \dfrac{f(x)}{g(x)}$

$q'(x) = \dfrac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$

$q'(2) = \dfrac{f'(2)g(2) - f(2)g'(2)}{(g(2))2}$

$q'(2) = \dfrac{(-2)(3) - (-5)(6)}{(3)^2}$

$q'(2) = \dfrac{-6 + 30}{9} = \dfrac{24}{9}$

$\boxed{3.5}$

(21) $f'(x) = 2 + \sin x$

(22) $y' = 3x^2 \sec x + x^3(\sec x \tan x)$

$y' = x^2 \sec x(3 + x\tan x)$

(23) $g'(x) = \dfrac{5(\cot x) - 5x(-\csc^2 x)}{\cot^2 x}$

$g'(x) = \dfrac{5\cot x + 5x\csc x}{\cot^2 x}$

(24) $s(t) = 3t\sin t$

$s'(t) = 3\sin t + 3t\cos t$

$s''(t) = 3\cos t + (3\cos t + 3t(-\sin t))$

$s''(t) = 3\cos t + 3\cos t - 3t\sin t$

(25)

$f'(x) = 3\cos x\cos x + 3\sin x(-\sin x)$

$f'(\pi/4) = 3(\frac{1}{\sqrt{2}})(\frac{1}{\sqrt{2}}) - 3(\frac{1}{\sqrt{2}})(\frac{1}{\sqrt{2}})$

$= 3/2 - 3/2$

$= 0$

$\boxed{3.6}$

26. $x(t) = 2t^2 - \sin t$

$v(t) = 4t - \cos t$

$a(t) = 4 - (-\sin t)$
$= 4 + \sin t$

27. $y(t) = \frac{t+1}{t^2}$

$v(t) = \frac{1(t^2) - (t+1)(2t)}{(t^2)^2}$

$v(t) = \frac{t^2 - 2t^2 - 2t}{t^4}$

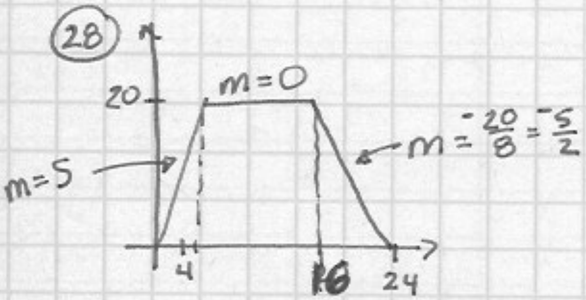
$v(t) = \frac{-t^2 - 2t}{t^4}$

$a(t) = \frac{(-2t-2)(t^4) - (-t^2-2t)(4t^3)}{(t^4)^2}$

$a(t) = \frac{-2t^5 - 2t^4 + 4t^5 + 8t^4}{t^8}$

$a(t) = \frac{+2t^5 + 6t^4}{t^8}$

28.



v(t) is graph value
a(t) is slope value

$v(2) = 10$ $v(12) = 20$ $v(20) = 10$
$a(2) = 5$ $a(12) = 0$ $a(20) = \frac{-5}{2}$

29. $s(t) = -16t^2 + 75t + 230$
$s'(t) = v(t) = -32t + 75$
$s''(t) = a(t) = -32$

a.) ave velocity
$s(0) = 230$
$s(5) = 205$
$V_{ave} = \frac{205 - 230}{5 - 0}$
$V_{ave} = \frac{-25}{5} = -5$

b.) $v(5) = -32(5) + 75$
$v(5) = -85$

c.) $a(5) = -32$

d.) $0 = -16t^2 + 75t + 230$
w/ graph calc

$t = 6.8011219$

e.) $v(6.8011219) = -142.6359$