Exam 2

$\boxed{\#1}$ $f = 2x^2+5x \Rightarrow f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} =$

$\lim_{h\to 0} \frac{2(x+h)^2+5(x+h)-(2x^2+5x)}{h} =$

$\lim_{h\to 0} \frac{\cancel{2x^2}+4xh+2h^2+\cancel{5x}+5h-\cancel{2x^2}-\cancel{5x}}{h} =$

$\lim_{h\to 0} \frac{\cancel{h}(4x+2h+5)}{\cancel{h}} = \lim_{h\to 0} 4x+2h+5 = 4x+5.$

$\boxed{\#2}$ (a) $g'(x)=0$ for $x=0,2$

(b) $g'(x)>0$ on $(-2,0)\cup(2,3)$

(c) $g'(x)$ DNE for $x=-2,3$

$\boxed{\#3}$ (a) $y' = 20x^4-15x^{-4}+6\sec x\tan x+4\cos x - \frac{7}{x^2+1}$

(b) $y' = (8x+2)e^x+(4x^2+2x+3)e^x$

$= (4x^2+10x+5)e^x$

(c) $y' = \frac{(x^2+5)(6)-2x(6x-2)}{(x^2+5)^2} = \frac{-6x^2+4x+30}{(x^2+5)^2}$

(d) $$y' = \frac{5x^4+9x^2+2}{x^5+3x^3+2x}$$

(e) $$y' = \frac{5}{\sqrt{1-(5x+1)^2}}$$

(f) $$y' = 2e^{2x}\cos 3x - 3e^{2x}\sin(3x)$$

(g) $$y' = 5(3x+\tan(4x+1))^4 \cdot (3+4\sec^2(4x+1))$$

(h) $$y = \ln(3x+1) - 4\ln(2x+5) \rightarrow$$

$$y' = \frac{3}{3x+1} - \frac{8}{2x+5}$$

$\boxed{\#4}$ $$3x^2 - e^{2y} - 2xe^{2y}\cdot y' + 4y^3 y' = 0$$

(a) $$y' = \frac{e^{2y}-3x^2}{4y^3-2xe^{2y}}$$

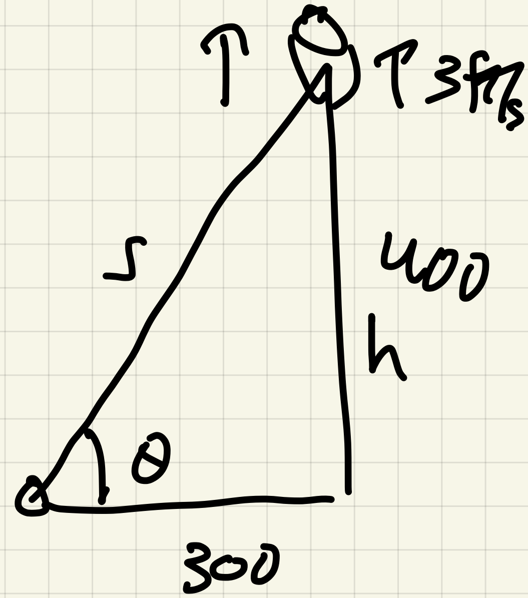
(b) $$\left.\frac{dy}{dx}\right|_{(3,0)} = \frac{1-27}{0-6} = \frac{-26}{-6} = \frac{13}{3}$$

$\boxed{\#5}$ $v = 3t^2-18t+6$, $a = 6t-18$

$a=0 \rightarrow t=3$, $v(3) = 27-54+6$

$= -21$

$\boxed{\#6}$



(a) $s = \sqrt{300^2 + h^2}$

$$\frac{ds}{dt} = \frac{2h \cdot h'}{2\sqrt{300^2 + h^2}} =$$

$$\frac{\cancel{2}(400)(3)}{\cancel{2}\sqrt{300^2 + 400^2}} = \frac{1200}{500} = \frac{12}{5} = 2.4 \text{ ft/sec.}$$

(b) $\theta = \arctan \frac{h}{300} \Rightarrow$

$$\frac{d\theta}{dt} = \frac{1}{1 + \left(\frac{h}{300}\right)^2} \cdot \frac{h'}{300} = \frac{3}{\left(\frac{25}{9}\right) \cdot 300} =$$

$$\frac{9}{2500} = .0036 \text{ rad/sec.}$$