1) a) $(\sin x)(2x) + x^2(\cos x)$

b) $3(2x^2-6)^2(4x)$

c) $\dfrac{(\sin x)\,2(x^2-1)(2x) - (x^2-1)^2\cos x}{\sin^2 x}$

d) $3\cdot\sin^2(x^2\ln x)\cdot\cos(x^2\ln x)\left[x^2\dfrac{1}{x} + (\ln x)2x\right]$

e) $e^{\cos 2x}(-\sin 2x)\cdot 2$

2) a) $3e^{-2x} = 5$

$e^{-2x} = \frac{5}{3}$

$\ln e^{-2x} = \ln \frac{5}{3}$

$-2x = \ln \frac{5}{3}$

$x = \frac{\ln \frac{5}{3}}{-2}$

b) $\ln 4x - 3\ln x^2 = \ln 2$

$\ln 4x - \ln x^6 = \ln 2$

$\ln \frac{4x}{x^6} = \ln 2$

$\ln \frac{4}{x^5} = \ln 2$

e e

$\frac{4}{x^5} = 2$

$4 = 2x^5$

$2 = x^5$

$x = \sqrt[5]{2}$

3) $2x^3 - 3y^2 = 12xy$

$6x^2 - 6y\frac{dy}{dx} = 12x\frac{dy}{dx} + y \cdot 12$

$\frac{dy}{dx} = \frac{6x^2 - 12y}{12x + 6y}$

4)

$x^2 = 3000^2 + y^2$

$2x\frac{dx}{dt} = 0 + 2y\frac{dy}{dt}$

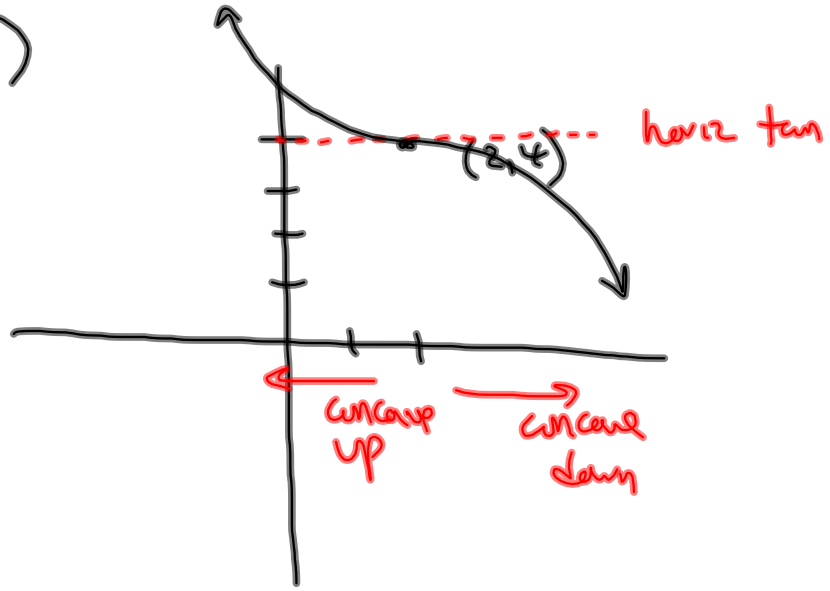
$\frac{dx}{dt} = \frac{y}{x}\frac{dy}{dt} =$

$\frac{dy}{dt} = 880$

$\left.\frac{dx}{dt}\right|_{\substack{y=4000 \\ x=5000}} = \frac{4000}{5000}(880)$

$= 704 \text{ ft/sec}$

5)



6) $f(x) = (2x-1)^5$

$f'(x) = 5(2x-1)^4 \cdot 2 = 10(2x-1)^4 \stackrel{?}{=} 0$

$f''(x) = 40(2x-1)^3 \cdot 2$

$= 80(2x-1)^3$

$2x-1=0$

$2x=1$

$x=\frac{1}{2}$

$f''(\frac{1}{2}) = 0$ ☹

no rel extrema

$f''(0)$

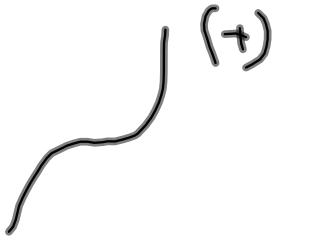
$80(-1)^3$

$(-)$

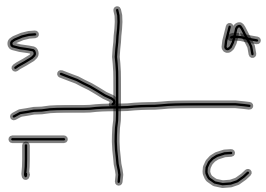
$f''(1)$

$80(1)^3$

$(+)$



7) $f(x) = \sin x - \cos x \qquad [0, \pi]$



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

$= \cos x + \sin x = 0$

$\sin x = -\cos x$

@ $\frac{\pi}{4}$ $\sin x = \frac{\sqrt{2}}{2}$ $\cos x = \frac{\sqrt{2}}{2}$

@ $\frac{3\pi}{4}$ $\sin x = \frac{\sqrt{2}}{2}$ $\cos x = -\frac{\sqrt{2}}{2}$

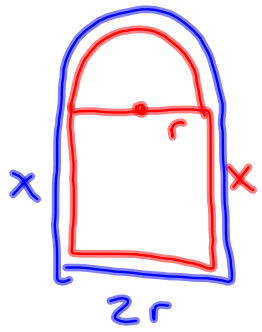
crit pt $x = \frac{3\pi}{4}$

$f(0) = \sin 0 - \cos 0 = -1$ min

$f\left(\frac{3\pi}{4}\right) = \sin\frac{3\pi}{4} - \cos\frac{3\pi}{4} = \sqrt{2}$ max

$f(\pi) = \sin\pi - \cos\pi = +1$

8) $A = (x \cdot 2r) + \frac{\pi r^2}{2}$



$P = \frac{2\pi r}{2} + 2r + 2x$

$P_{rect} = 4r + 2x$

$x = \frac{P - 4r}{2}$

$A = \left(\frac{P-4r}{2}\right)2r + \frac{\pi r^2}{2}$

$= Pr + \left(\frac{\pi}{2} - 4\right)r^2$

$A'(r) = P + 2\left(\frac{\pi}{2} - 4\right)r = P + (\pi - 8)r = 0$

$r = -\frac{P}{\pi - 8}$

9) $s(t) = t^3 - 6t^2$ $\quad t \geq 0$

$v(t) = 3t^2 - 12t$

$a(t) = 6t - 12$

$v(t) = 0$?

$3t^2 - 12t = 0$

$t(3t - 12) = 0$

$t = 0 \quad 3t - 12 = 0$

$\equiv \quad t = 4$

disp $s(5) = 5^3 - 6(5)^2$

$= 125 - 150$

$= -25\text{ m}$

dist $s(0) = 0$

$s(4) = 4^3 - 6(4^2) = 64 - 96$

$= -32$

$s(5) = -25\text{ m}$

7m

$32 + 7 = 39$

10) $f(x) = x^2 - 7$ $\qquad \sqrt{7} = ?$

$f'(x) = 2x$

let $x_1 = 3$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 3 - \frac{2}{6} = 2.667$$

$$x_3 = 2.667 - \frac{f(2.667)}{f'(2.667)} = 2.979$$

$$x_4 = 2.797 - \text{wwww} = 2.664$$

$\sqrt{7} = 2.646\ldots$