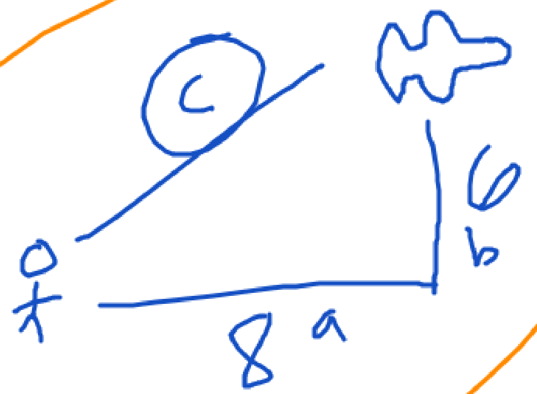
VA. #1 plane flying 400 mph @ alt. of 6 miles how fast is the distance b/w you increasing when the plane is above a point 8 miles from you?



$a = 8$ $\quad b = 6$ $\quad c = 10$

$\frac{da}{dt} = 400$ $\quad \frac{db}{dt} = 0$ $\quad \frac{dc}{dt} = ?$

$c^2 = a^2 + b^2$

$c^2 = 64 + 36$

$= 100 \rightarrow c = 10$

$$a^2 + b^2 = c^2$$

$$2a\frac{da}{dt} + 2b\frac{db}{dt} = 2c\frac{dc}{dt}$$

$$\cancel{2}(8)(4\cancel{0}0) + \cancel{2(6)(0)} = \cancel{2}(1\cancel{0})\frac{dc}{dt}$$

$$8 \cdot 40 = \frac{dc}{dt}$$

$$\rightarrow \boxed{320 = \frac{dc}{dt}}$$

VB: $\boxed{180}$

VB #2

$$P(t) = 2000\left(1 + \frac{t}{64+t^2}\right)$$

after 6 hours: increasing or decreasing?

$$P'(t) = 2000\left(\frac{(64+t^2)(1) - t(2t)}{[64+t^2]^2}\right)$$

$$= 2000\left(\frac{64-t^2}{[64+t^2]^2}\right)$$

$t=6$

$$P'(6) = 2000\left[\frac{64-36}{[64+36]^2}\right] = 2000\left[\frac{28}{10000}\right]$$

V.A: $-2.8 < 0$

$$\frac{28 \cdot 2}{10} = \frac{56}{10} = 5.6 > 0$$

VA #3

x	f	f'	g	g'
1	2	7	3	-1
2	1	-3	1	-5
3	5	4	0	1

a) $A(x) = f(x) + g(x)$

$A'(1) = ?$

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

$A'(1) = f'(1) + g'(1)$

$= 7 - 1 = 6$

b) $B(x) = f(x)g(x)$

$B'(3) = ?$

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

$= 4(0) + (1)(5)$

$= 5$

c) $C(x) = \frac{f(x)}{g(x)}$

$C'(2) = ?$

$$C'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

$$= \frac{(1)(-3) - (1)(-5)}{[1]^2}$$

$$= -3 - (-5)$$

$$= 2$$

D) $D(x) = f(g(x))$

$D'(2) = ?$

$$D'(x) = f'(g(x))\, g'(x)$$

$$= f'(1)\, g'(2)$$

$$7(-5)$$

$$\boxed{= -35}$$

Ver B.) a) 5 b) -8 c) $\frac{23}{9}$ d) -4

VB #4 find vertical tangent lines of

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

$$2x + 3y^2 \frac{dy}{dx} = -2xy^3 - x^2\left[3y^2\right]\frac{dy}{dx}$$

$$3y^2 \frac{dy}{dx} + 3x^2y^2 \frac{dy}{dx} = -2xy^3 - 2x$$

$$\frac{dy}{dx}\left[3y^2 + 3x^2y^2\right] = -2xy^3 - 2x$$

$$\frac{dy}{dx} = \frac{-2xy^3 - 2x}{3y^2 + 3x^2y^2} = 0$$

$$3y^2 + 3x^2y^2 = 0$$

$$3y^2\left[1 + x^2\right] = 0$$

$$y = 0$$

$$x^2 = 1$$

$$x = 1, \quad x = -1$$

$$(1, 0), \quad (-1, 0)$$

VA #5 differentiate

$$y = [\cos(x)]^{\ln(x)}$$

$$\ln(y) = \ln(x)\ln(\cos(x))$$

$$\frac{1}{y}y' = \frac{1}{x}\ln(\cos(x)) + \ln(x)\frac{1}{\cos(x)}[-\sin(x)]$$

$$y' = \left[\frac{\ln(\cos(x))}{x} - \ln(x)\tan(x)\right][\cos(x)]^{\ln(x)}$$