#1 $f(x) = \frac{\sin x}{x^2}$

$f'(x) = \frac{x^2 \cos x - 2x \sin x}{x^4}$

#2 $f(x) = \sec(1+x^2)$

$f'(x) = \sec(1+x^2)\tan(1+x^2)\,2x$

#3 $f(x) = (x^2 - x + 1)^3$

$f'(x) = 3(x^2-x+1)^2(2x-1)$

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

$f'(x) = 4(2x-5)^3(2)(8x^2-5)^{-3} + (-3)(8x^2-5)^{-4}(16x)(2x-5)^4$

#5 $f(x) = \frac{(x-1)^4}{(x^2+5x)^5}$

$f'(x) = \frac{(x^2+5x)^5 4(x-1)^3 - (x-1)^4 5(x^2+5x)^4(2x+5)}{(x^2+5x)^{10}}$

#6 $f(x) = \ln(x\cos x)$

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

#7 $1 + x = \ln(xy^2)$

$$1 = \cos(xy^2)(x \cdot 2yy' + y^2)$$

$$1 = 2xy\cos(xy^2)\,y' + y^2\cos(xy^2)$$

$$1 - y^2\cos(xy^2) = 2xy\cos(xy^2)\,y'$$

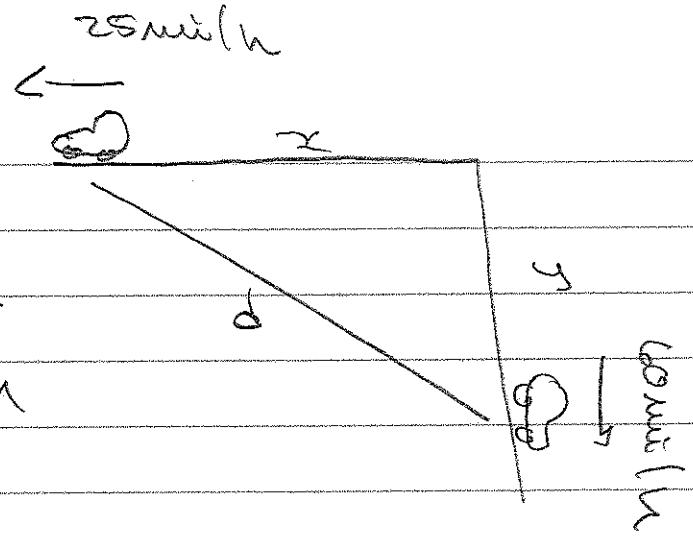
$$y' = \frac{1 - y^2\cos(xy^2)}{2xy\cos(xy^2)}$$

#8 $y = \sqrt{x^2+1} = (x^2+1)^{1/2}$

$$y' = \tfrac{1}{2}(x^2+1)^{-1/2}\,2x$$
$$= x(x^2+1)^{-1/2}$$

$$y'' = x\left(-\tfrac{1}{2}\right)(x^2+1)^{-3/2}(2x) + (x^2+1)^{-1/2}$$

#9



$\frac{dx}{dt} = 25 \text{ mi/h}$

$\frac{dy}{dt} = 60 \text{ mi/h}$

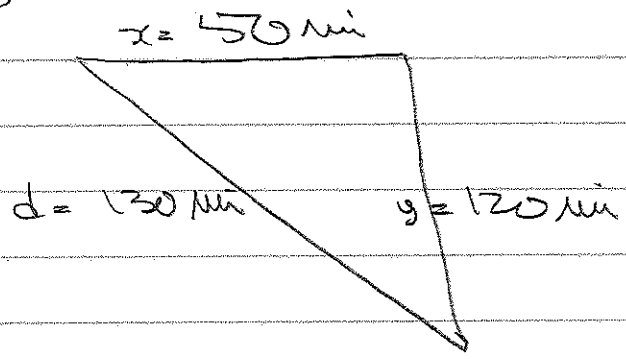
$\frac{dd}{dt} = ?$

$$d^2 = x^2 + y^2$$

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

$$\frac{dd}{dt} = \frac{x}{d}\frac{dx}{dt} + \frac{y}{d}\frac{dy}{dt}$$

after 2 hours



$$\frac{dd}{dt} = \frac{50 \text{ mi}}{130 \text{ mi}}\left(-25 \text{ mi/h}\right) + \frac{120 \text{ mi}}{130 \text{ mi}}\left(60 \text{ mi/h}\right)$$

$$= 65 \text{ mi/h}$$