2.5

7. $x^3y^3 - y = x$

$\ln e^x = x$

$x \ln e = x$

$\log_e e^x = x$

$(x^3)'y^3 + x^3(y^3)' - y' = 1$

$3x^2 \cdot y^3 + x^3 \cdot 3y^2 \cdot y' - y' = 1$

$y'(3x^3y^2 - 1) = 1 - 3x^2y^3$

$y' = \frac{1 - 3x^2y^3}{3x^3y^2 - 1}$

2.5

12. $[(\sin \pi x + \cos \pi y)^2]' = [2]'$

$2(\sin \pi x + \cos \pi y)(\pi \cos \pi x - \pi y' \sin \pi y) = 0$

$\pi \sin \pi x \cos \pi x - \pi y' \sin \pi x \sin \pi y + \pi \cos \pi x \cos \pi y - \pi y' \sin \pi y \cos \pi y = 0$

$\pi \sin \pi x \cos \pi x + \pi \cos \pi x \cos \pi y = y'(\pi \sin \pi y \cos \pi y + \pi \sin \pi x \sin \pi y)$

$y' = \frac{\pi \sin \pi x \cos \pi x + \pi \cos \pi x \cos \pi y}{\pi \sin \pi y \cos \pi y + \pi \sin \pi x \sin \pi y}$

$= \frac{\cos \pi x (\sin \pi x + \cos \pi y)}{\sin \pi y (\cos \pi y + \sin \pi x)}$

$= \frac{\cos \pi x}{\sin \pi y}$

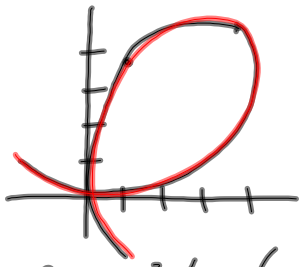
16. $x = \sec\frac{1}{y}$

$x = \sec(y^{-1})$

$1 = \sec(y^{-1})\tan(y^{-1}) \cdot (-y^{-2} \cdot y')$

$y' = \dfrac{-1}{\sec y^{-1} \tan y^{-1} y^{-2}} = \boxed{-y^2 \csc y^{-1} \cot y^{-1}}$

32. Folium of Descartes



$x^3 + y^3 - 6xy = 0$

find the slope of the tangent line @ $\left(\frac{4}{3}, \frac{8}{3}\right)$

$3x^2 + 3y^2y' + (-6y + -6xy') = 0$

$3y^2y' - 6xy' = 6y - 3x^2$

$y' = \dfrac{6y - 3x^2}{3y^2 - 6x}\Bigg|_{\left(\frac{4}{3}, \frac{8}{3}\right)} = \dfrac{2y - x^2}{y^2 - 2x}$

$m = \dfrac{2\left(\frac{8}{3}\right) - \left(\frac{4}{3}\right)^2}{\left(\frac{8}{3}\right)^2 - 2\left(\frac{4}{3}\right)} = \dfrac{\frac{16}{3} - \frac{16}{9}}{\frac{16}{9} - \frac{8}{3}} = \dfrac{\frac{48-16}{9}}{\frac{64-24}{9}}$

$= \dfrac{32}{40} = \boxed{\frac{4}{5}}$

40. Find y'' in terms of x & y.

$y^2 = 4x$

$2yy' = 4$

$y' = \frac{4}{2y} = \frac{2}{y}$

$y' = 2y^{-1}$

$y'' = -2y^{-2} \cdot y' = -2y^{-2}(2y^{-1}) = -4y^{-3}$

$$y'' = \frac{-4}{y^3}$$

2.5 # 11-15 odd, 29, 31, 35-39 odd