3.2: Exer: 2, 3, 8, 19, 27

2) find dy/dx

$x^2y + xy^2 = 6$

$x^2y' + y \cdot 2x + x\,2yy' + y^2(1) = 0$

$x^2y' + 2xy + 2xyy' + y^2 = 0$

$-2xy - y^2$

$x^2y' + 2xyy' = -2xy - y^2$

$y'\cancel{(x^2+2xy)}$

$\dfrac{y'x(x+2y)}{x(x+2y)} = \dfrac{y(-2x-y)}{x(x+2y)}$

$y' = \dfrac{y(-2x-y)}{x(x+2y)}$

3) $y^2 = \dfrac{x-1}{x+1}$

$\dfrac{d}{dx}[y^2] = \dfrac{d}{dx}\left[\dfrac{x-1}{x+1}\right]$

$2yy' = \dfrac{(x+1)(1) - (x-1)(1)}{(x+1)^2}$

$2yy' = \dfrac{(x+1) - x + 1}{(x+1)^2}$

$\dfrac{2yy'}{2y} = \dfrac{2}{(x+1)^2}$

$y' = \dfrac{\frac{2}{(x+1)^2}}{2y} \cdot \dfrac{(x+1)^2}{(x+1)^2}$

$\cancel{y' = \dfrac{2(x+1)^2}{2y(x+1)^2}}$

$y' = \dfrac{2}{2y(x+1)^2}$

$\boxed{= \dfrac{1}{y(x+1)^2}}$

8) $x + \sin y = xy$

$\dfrac{d}{dx}[x + \sin y] = \dfrac{d}{dx}[xy]$

$1 + \cos y\, y' = xy' + y$

$\cos y\, y' = xy' + y - 1$

$\cos y$

$\cancel{y' = \dfrac{xy' + y - 1}{\cos y}}$

$\cos y\, y' = xy' + y - 1$

$-xy'$

$\dfrac{\cos y\, y' - xy'}{\cos y - x} = \dfrac{y-1}{\cos y - x}$

$y' = \dfrac{y-1}{\cos y - x}$

19.) line of tand and normal

$x^2y^2 = 9$; $(-1, 3)$

$T = 3(x+1)+3$

$N = -\frac{1}{3}(x+1)+3$

$\frac{d}{dx}[x^2y^2 = 9]$

$x^2 \cdot 2yy' + y^2 2x = 0$

$2x^2yy' + 2xy^2 = 0$

$\frac{2x^2yy' = -2xy^2}{2x^2y}$

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

$= \frac{-y}{x}$

$y'(-1) = \frac{-3}{-1}$

22.) $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

$x^2+y^2 = 1$

$\frac{d}{dx}[x^2+y^2=1]$

$2x+2yy' = 0$

$\frac{2yy' = -2x}{2y}$

$y' = -\frac{x}{y}$

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

$= \frac{-y+xy'}{y^2}$

$= \frac{-y+x\frac{-x}{y}}{y^2} \cdot \frac{y}{y}$

$= \frac{\cancel{(y^2+x^2)}}{y^3}$