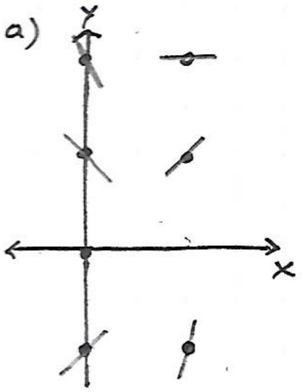
AP Calculus AB — WS 99 - Diff. Equations - FRQ 2

2015 #4

$$\frac{dy}{dx} = 2x - y$$

a)



b) $\frac{dy}{dx} = 2x - y$

$$\frac{d^2y}{dx^2} = 2 - \frac{dy}{dx}$$
$$= 2 - (2x - y)$$
$$= 2 - 2x + y$$

In Quad. II, $x<0$ & $y>0$

So, $\frac{d^2y}{dx^2} > 0$. All solution curves are concave up.

c) $f(2) = 3$

$$\left.\frac{dy}{dx}\right|_{(2,3)} = 1 \neq 0$$

f has neither a max nor min.

d) $y = mx + b \Rightarrow y = 2x - m$

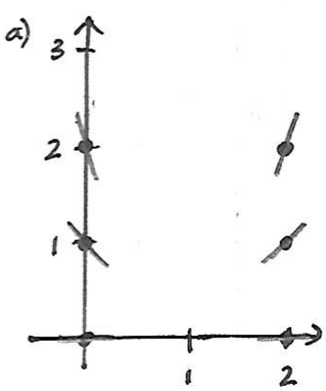
$$\frac{dy}{dx} = m$$
$$2x - y = m$$
$$-y = -2x + m$$
$$y = 2x - m$$

$\boxed{m = 2 \quad b = -2}$

2016 #4

$$\frac{dy}{dx} = \frac{y^2}{x-1}$$

a)



b) $f(2) = 3$ $\quad \left.\frac{dy}{dx}\right|_{(2,3)} = 9$

$$y - 3 = 9(x-2)$$
$$L(x) = 3 + 9(x-2)$$

$$L(2.1) = 3 + 9(0.1)$$
$$f(2.1) \approx 3.9$$

c) $\frac{dy}{dx} = \frac{y^2}{x-1}$

$$\frac{1}{y^2}\,dy = \frac{1}{x-1}\,dx$$
$$y^{-2}\,dy = (x-1)^{-1}\,dx$$
$$-y^{-1} = \ln|x-1| + C$$
$$y^{-1} = -\ln|x-1| + C$$
$$y = (-\ln|x-1| + C)^{-1}$$
$$3 = (-\ln 1 + C)^{-1}$$
$$\frac{1}{3} = C$$

$$\boxed{y = \left(-\ln|x-1| + \frac{1}{3}\right)^{-1}}$$