Homework 10

8. $x(t) = t^3$ $y(t) = e^t$, $(\ln(2))^3, 2)$ $(3\ln(2), 2)$

$$\frac{dy}{dx} = \frac{e^t}{3t^2} = \frac{e^{\ln 2}}{3\ln(2)^2} = \frac{2}{6\ln 2} = \frac{1}{3\ln 2}$$

$\ln 2 = (e^t)\ln$ $\quad \sqrt[3]{\ln 2^3} = \sqrt[3]{t^3}$

$\ln 2 = t$ $\quad \ln 2 = t$

m p

$(3\ln(2), 2)$

$$y - 2 = \frac{1}{3\ln 2}(x - 3\ln 2)$$

$$y = \frac{1}{3\ln 2}x + 1$$

$$\frac{d\left[\frac{dy}{dx}\right]}{dx} = \frac{6te^t - 3t^2e^t}{3t^2} = \frac{3te^t(2-t)}{3t^2} = \frac{e^t(2-t)}{t} = \frac{d^2y}{dx^2}$$

9. $x(t) = e^t \sin t$ $y(t) = e^t \cos t$ $(0,1)$ $t = 0$

$0 = e^t \sin t$ $\quad 1 = e^t \cos t$

$t = 0, \pi, 2\pi$ $\quad t = 0$

$$\frac{dy}{dx} = \frac{e^t(-\sin t) + e^t \cos t}{e^t(\cos t) + e^t(\sin t)} = \frac{\cos t + \sin t}{\cos t + \sin t} \quad @\, t=0 = \frac{1-0}{1+0} = 1$$

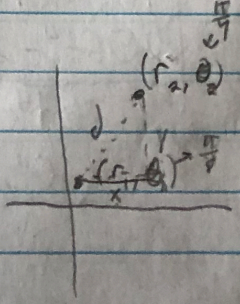
$$y - 1 = 1(x - 0) = y = x + 1$$

$$\frac{d\left[\frac{dy}{dx}\right]}{dx} = \frac{e^t(\cos t) + e^t(-\sin t) + e^t(-\sin t) + e^t \cos t}{e^t \cos t + e^t \sin t}$$

$$\frac{d^2y}{dx^2} = \frac{-2\sin t}{\cos t + \sin t}$$

10. Prove distance from $(r_1, \theta_1) \to (r_2, \theta_2)$ =

$$d = \sqrt{r_1^2 + r_2^2 - 2r_1 r_2 \cos(\theta_1 - \theta_2)}$$



$x^2 + y^2 = r^2$

$d = r$

$x = d\cos(\theta_1 - \theta_2)$

$y = d\sin(\theta_1 - \theta_2)$

$$(d\cos(\theta_1 - \theta_2))^2 + (d\sin(\theta_1 - \theta_2))^2 = d^2$$

$$d^2\cos(\theta_1 - \theta_2)^2 + d^2\sin(\theta_1 - \theta_2)^2 = d^2$$

$\cos(\theta_1 - \theta_2)^2 -$