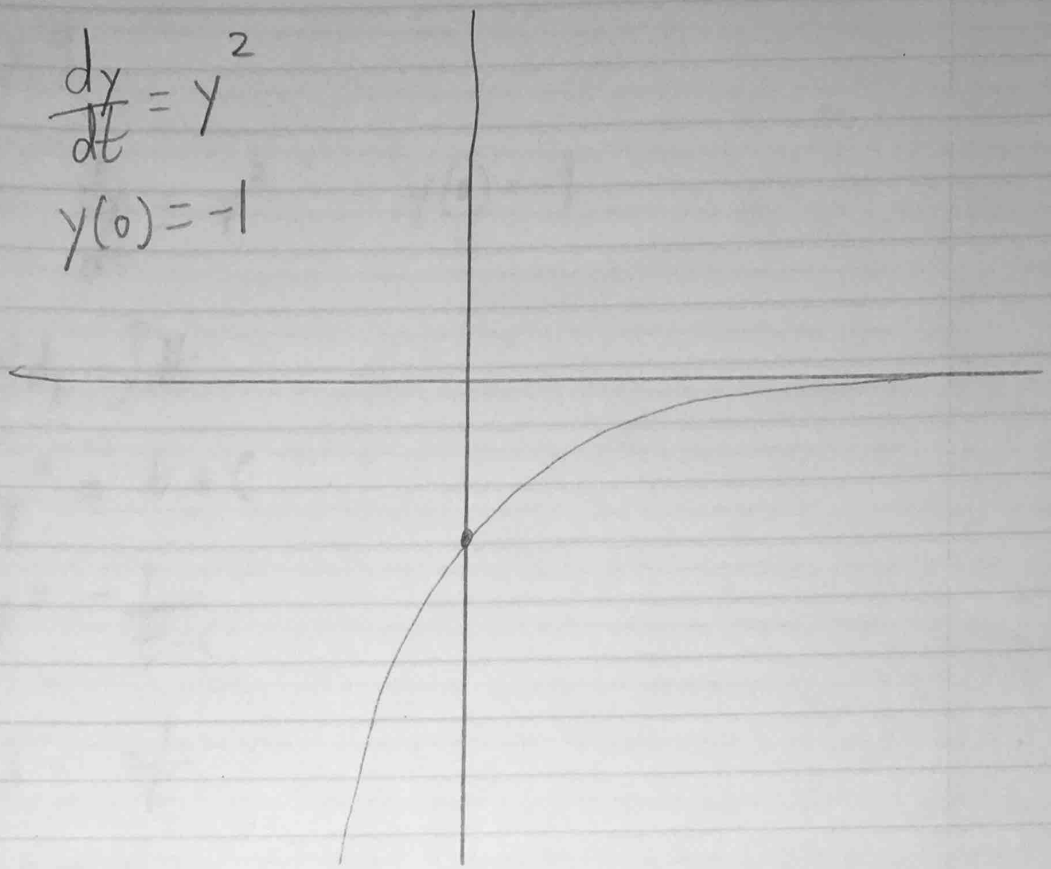
Lucas Barnes

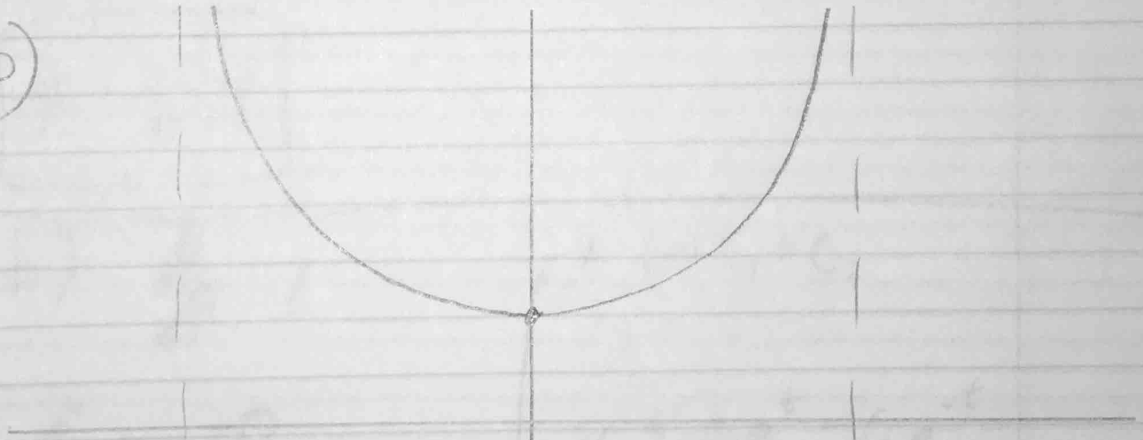
P2.3

a) $\frac{dy}{dt} = y^2$

$y(0) = -1$



b)



$\frac{d^2y}{dt^2} = y$

$y(0) = 1$

$\frac{dy}{dt}(0) = 0$

P2.4

a) $\frac{dy}{dt} = y^2 \qquad y(0) = -1$

$\int y^{-2}\,dy = \int dt$

$-y^{-1} = t + C$

$y = -\frac{1}{t+C}$

$-1 = -\frac{1}{C}$

$C = 1$

$$\boxed{y = -\frac{1}{t+1}}$$

b) $\frac{d^2y}{dt^2} = y$

$y'' - y = 0$

$y = e^{rt}$

$r^2 - 1 = 0$

$r = -1, 1$

$y = C_1 e^{t} + C_2 e^{-t}$

$1 = C_1 + C_2$

$y' = C_1 e^{t} - C_2 e^{-t}$

$0 = C_1 - C_2$

$C_1 = C_2 = .5$

$y = \frac{e^{t} + e^{-t}}{2}$