

Part 1**1.1, Problem 2**

$$\begin{aligned}\frac{dy}{dt} &= \frac{(t^2 - 1)(y^2 - 2)}{y^2 - 4} \\ \int \frac{y^2 - 4}{y^2 - 2} dy &= \int t^2 - 1 dt \\ \int 1 - \frac{1}{\sqrt{2}(y - \sqrt{2})} + \frac{1}{\sqrt{2}(y + \sqrt{2})} dy &= \frac{t^3}{3} - t + C \\ y - \frac{1}{\sqrt{2}} \ln \left| \frac{y + \sqrt{2}}{y - \sqrt{2}} \right| &= \frac{t^3}{3} - t + C\end{aligned}$$

1.1, Problem 3

- (a) When $P = 0$ or $P = 230$, the population is in equilibrium.
- (b) If P is between 0 and 230, the population is increasing.
- (c) If P is greater than 230 or less than 0, the population is decreasing.

1.1, Problem 13

Learning occurs most rapidly when $L = 0$.

1.1, Problem 14

- (a) Both students are learning at the same rate at $t = 0$.
- (b) The student who starts out knowing none of the list will never catch up to the student who starts out knowing one half of the list, since both learn at the same rate at any given time.