

Exercise 2B. Consider a function that relates tax revenues R , in billions of dollars, to the average tax rate t such that $R = 350t - 500t^2$.

- (a) What tax rate(s) is consistent with raising tax revenues equal to \$60 billion?
 (b) What tax rate(s) is consistent with raising tax revenues equal to \$61.25 billion?
 (c) What tax rate is consistent with the maximum tax revenue?

$$R = 350t - 500t^2$$

$$\begin{aligned} \text{(a)} \quad 60 &= 350t - 500t^2 \\ 0 &= -500t^2 + 350 - 60 \\ 0 &= 10(-50t^2 + 35t - 6) \\ 0 &= 10(5t - 2)(-10t + 3) \\ 5t - 2 &= 0 \quad \text{and} \quad -10t + 3 = 0 \\ t &= \frac{2}{5} = 40\% \quad \quad \quad t = \frac{3}{10} = 30\% \end{aligned}$$

$\therefore$ 30% and 40% tax rates are consistent w/ 60 billion tax revenue.

$$\begin{aligned} \text{(b)} \quad 61.25 &= 350t - 500t^2 \\ 0 &= -500t^2 + 350 - 61.25 \\ 0 &= -\frac{5}{4}(20t - 7)^2 \\ (20t - 7)^2 &= 0 \\ 20t - 7 &= 0 \\ t &= \frac{7}{20} = 35\% \end{aligned}$$

$\therefore$ 35% tax rate is consistent w/ 61.25 billion tax revenue.

$$\begin{aligned} \text{(c)} \quad \frac{dR}{dt} &= 350 - 1000t = 0 \rightarrow \text{max revenue} \\ 350 &= 1000t \\ t &= 0.35 = 35\% \end{aligned}$$

$\therefore$ 35% tax rate is consistent w/ the maximum tax revenue.