Econ 300, Problem Set 2, Suggested Answers
Professor Cramton

3.1.6.

$$P_{2001} = \$50 \text{ million} * (1.06) = \$53 \text{ million}$$
$$P_{2003} = \$50 \text{ million} * (1.06)^3 = \$59.55 \text{ million}$$
$$P_{1998} = \$50 \text{ million} * (1.06)^{-2} = \$44.50 \text{ million}$$

3.2.8.

If you consider the interest rate as an annual interest rate compounded once per year, it's fine too. Below we use continuous compounding.

$$\text{At } 7\%, PV = 15000 * e^{-0.07} = 13,986$$
$$\text{At } 5\%, PV = 15000 * e^{-0.05} = 14,268$$
$$\text{At } 9.5\%, PV = 15000 * e^{-0.095} = 13,641$$

3.3.4.

Option 1:

Keep the collection which ensures you \$3000 after ten years. The cost of this option is the cost fee rising at the continuously compounded rate of 5%.

Cost(at the end of 10th year) $= 200 * e^{0.05*10} = \$329.75$

Net Value(at the end of 10th year) $= 3000 - 329.75 = \$2670.25$

Option 2:

Invest in the stock market, which yields a return of (at the end of 10th year) $= 1000 * e^{0.095*10} = \$2585.71$

Result:

Based on this information keep the collection!

3.3.10.

Given the Cobb-Douglas production function:

$$Q = 15L^{4/5}K^{1/5}$$

Transform the above function using natural logarithms into a linear function:

$$lnQ = ln(15) + \frac{4}{5}ln(L) + \frac{1}{5}ln(K)$$

If $L = 10$ and $K = 5$, then $lnQ = 4.872$ and $Q = exp(lnQ) = 130.6$

4.1.2.

(a) Use the condition x = y to get:

$$\begin{aligned} 6z + 3h - 4a + 10 &= 4z - h + 6 \\ \bar{z} &= 2a - 2h - 2 \end{aligned}$$

Use the second equation to figure out $\bar{y}$:

$$\begin{aligned} \bar{y} &= 4\bar{z} - h + 6 \\ \bar{y} &= 8a - 9h - 2 \end{aligned}$$

Then using the third equation we have $\bar{x} = \bar{y}$ Hence,

$$\begin{aligned} \bar{z} &= 2a - 2h - 2 \\ \bar{y} &= 8a - 9h - 2 \\ \bar{x} &= 8a - 9h - 2 \end{aligned}$$

(b)

$$\begin{aligned} \Delta x &= 8\Delta a \\ \Delta y &= 8\Delta a \\ \Delta z &= 2\Delta a \end{aligned}$$

(c)

$$\begin{aligned} \Delta x &= 16 \\ \Delta y &= 16 \\ \Delta z &= 4 \end{aligned}$$

6.2.8.

For $x_0 = 3$ and $x = 3$, then using the formula for the difference quotient found in the book on page 150, $\frac{\Delta y}{\Delta x} = 34$

(a) When $\Delta x = 1.5$ then $\frac{\Delta y}{\Delta x} = 28$
When $\Delta x = 0.5$ then $\frac{\Delta y}{\Delta x} = 24$

(b) In the limit, as Δx approaches zero, $\frac{\Delta y}{\Delta x} = 22$