

Name: Key**Directions:** Show all work. No credit for answers without work.

1. [2 points] After the price of a luxury car decreases by 4%, it costs \$28,499. Find the original price of the car.

$$RC = \frac{P_i - P_o}{P_o}$$

$$-0.04 = \frac{28499 - P_o}{P_o}$$

$$-0.04P_o = 28499 - P_o$$

$$0.96P_o = 28499$$

$$P_o = \frac{28499}{0.96} \approx \boxed{29686}$$

2. [3 parts, 1 point each] A new chocolate company builds a manufacturing plant that costs \$1,500,000. Each chocolate bar that they produce costs \$1.75 and sells for \$7.50.

- (a) Find formulas for the cost and revenue functions.

$$C(g) = 1500000 + 1.75g$$

$$R(g) = 7.5g$$

- (b) Find the company's fixed costs and the company's marginal cost.

Fixed costs: \$1,500,000

Marginal cost: \$1.75 per chocolate bar

- (c) How many chocolate bars must the company sell to make a profit?

$$C(g) = R(g)$$

$$1500000 + 1.75g = 7.5g$$

$$1500000 = 5.75g$$

$$g = \frac{1500000}{5.75}$$

$$= 260869.56$$

They must sell  $\boxed{260,870}$  Chocolate bars.

3. [0 points] Would you like to join a Math 122 study group? Please respond yes or no. By responding yes, you authorize me to include your name and USC email address in a message sent to your Math 122 study group. Each group will have at most 4 students chosen at random from the class.

4. [2 parts, 1 point each] Solve the following equations for  $x$  exactly. Decimal approximations are worth partial credit.

(a)  $2 \cdot 7^x = 5$

$$7^x = \frac{5}{2}$$

$$\ln(7^x) = \ln\left(\frac{5}{2}\right)$$

$$x \ln(7) = \ln(5) - \ln(2)$$

$$x = \boxed{\frac{\ln(5) - \ln(2)}{\ln(7)}}$$

(b)  $5e^{3x+1} = 2^x$

$$\ln(5) + 3x + 1 = x \ln(2)$$

$$3x - x \ln(2) = -\ln(5) - 1$$

$$x(3 - \ln(2)) = -\ln(5) - 1$$

$$x = \boxed{\frac{-\ln(5) - 1}{3 - \ln(2)}}$$

5. [3 parts, 1 point each] You are negotiating your compensation for a 3 year consulting project. Your client is willing to accept two payment plans. Payment Plan A consists of a one-time payment of \$200,000 three years from now, when the project is complete. Payment Plan B calls for an immediate payment of \$50,000, a payment of \$60,000 halfway through the project, and a final payment of \$70,000 when the project is complete. Assume that invested funds earn interest at a rate of 4%, compounded annually.

- (a) Find the future value of both plans in 3 years.

Plan A:  $\boxed{\$200,000}$

Plan B:  $P = 50,000(1.04)^3 + 60,000(1.04)^{1.5} + 70,000$

$$\approx \boxed{\$189,878.95}$$

- (b) Find the present value of both plans.

Plan A:  $200,000 = P_0 (1.04)^3$

$$P_0 = \frac{200,000}{(1.04)^3} \approx \boxed{\$177,799.30}$$

Plan B:  $189,878.95 = P_0 (1.04)^3 \parallel P_0 = \frac{189,878.95}{(1.04)^3} \approx \boxed{\$168,802}$

- (c) Which plan represents the better deal?

$\boxed{\text{Plan A}}$