1. (a) The cost of taking \( n \) rides is \( 1.5n \). Taking this together with the cost of admission, we get \( R(n) = 7 + 1.5n \).

(b) \( R(2) = 7 + 1.5(2) = 10 \). The park takes in $10 from a visitor who rides twice. \( R(8) = 7 + 1.5(8) = 19 \), so the park takes in $19 from a visitor who rides 8 times.

2. (a) The fixed costs are $4000, the \( y \)-intercept of the cost function. (\( C(0) \))

(b) The variable cost per unit is $2, the slope of the cost function.

(c) The company is charging $10 per unit – the slope of the revenue function.

(d) The graph is below. The company makes a profit for \( q > q_0 \) because for those values of \( q \), the revenue function is greater than the cost function.

(e) The break-even point is where \( C(q) = R(q) \), or \( 4000 + 2q = 10q \). Thus \( 4000 = 8q \), so \( q = 500 \).

3. The fixed cost is \( C(0) \), which is $5000 in this case. For every 5 units produced, the cost increases by $20, so the marginal cost is \( 20/5 = 4 \) dollars. Therefore, \( C(q) = 5000 + 4q \).

4. (a) The fixed cost is \( C(0) \), the \( y \)-intercept of the line shown. That appears to be at about 80, so the fixed cost is $80. The points (30, 300) and (10, 150) are on the line, so the slope (i.e., variable cost) is \( \frac{300 - 150}{30 - 10} = \frac{150}{20} = 7.5 \) dollars per unit.

(b) We saw above that \( C(10) \) appears to be about 150, so it costs the company about $150 to produce 10 units.

5. (a) The lines meet at about \( q \approx 340 \) units, so the company needs to produce more than that to make a profit.

(b) \( P(600) = R(600) - C(600) \approx 2400 - 1750 = 650 \) dollars.

6. (a) The fixed cost is the \( y \)-intercept, $1000. The variable cost is the slope, which appears to be about \( \frac{4000 - 1000}{200 - 0} = 15 \) dollars per unit.

(b) It costs $2500 to produce 100 units.

7. See the graph below.

8. (a) \( C(500) = 6000 + 10(500) = 11000 \) and \( R(500) = 12(500) = 6000 \). The company does not make a profit with \( q = 500 \). \( C(5000) = 6000 + 10(5000) = 56000 \) and \( R(5000) = 12(5000) = 60000 \), so the company makes a $4000 profit with \( q = 5000 \).
(b) Solve:

\[
6000 + 10q = 12q \\
6000 = 2q \\
3000 = q.
\]

The break-even point is at \( q = 3000 \) units.

9. (a) The cost function is \( C(q) = 6000 + 2q \), the revenue function is \( R(q) = 5q \), and the profit function is \( P(q) = R(q) - C(q) = 5q - (6000 + 2q) = 3q - 6000 \).

(b) For the break-even point, solve:

\[
3q - 6000 = 0 \\
3q = 6000 \\
q = 2000.
\]

The company breaks even if it sells 2000 units.

10. (a) \( C(q) = 5000 + 30q; R(q) = 50q \).

(b) The marginal cost is $30 and the marginal revenue is $50.

(c) The graph is below.

(d) Solve:

\[
5000 + 30q = 50q \\
5000 = 20q \\
250 = q.
\]

Thus, the break-even point is at \( q = 250 \) units.
11. (a) $C(q) = 650000 + 20q$, $R(q) = 70q$, and $P(q) = 70q - (650000 + 20q) = 50q - 650000$.
(b) The marginal cost is $20$ per pair, the marginal revenue is $70$ per pair, and the marginal profit is $50$ per pair.
(c) We need the break-even point:

\[
50q - 650000 = 0 \\
50q = 650000 \\
q = 13000.
\]

Thus, the company must make and sell more than 13000 pairs of shoes in order to make a profit.

13. (a) $C_1(q) = 100 + 0.03q$ and $C_2(q) = 200 + 0.02q$.
(b) $C_1(5000) = 100 + 0.03(5000) = 250$ dollars. $C_2(q) = 200 + 0.02(5000) = 300$ dollars. The first price list is cheaper in this case.
(c) Solve:

\[
100 + 0.03q = 200 + 0.02q \\
0.01q = 100 \\
q = 10000.
\]

Both plans are the same for 10000 copies.

14. (a) We have points $(0, 15000)$ and $(10, 0)$ representing the robot’s beginning and ending values. The slope of the line joining these points is $\frac{15000 - 0}{0 - 10} = -1500$. The value $V$ after $t$ years is given by $V(t) = -1500t + 15000$.
(b) $V(3) = -1500(3) + 15000 = 10500$ dollars.

15. (a) The points we are given are $(0, 50000)$ and $(20, 10000)$. The slope of the line through these points is $\frac{50000 - 10000}{0 - 20} = -2000$. The value therefore $V(t) = -2000t + 50000$ $t$ years after the tractor is purchased.
(b) See below.
(c) The vertical intercept is $50000$; that is the tractor’s initial value. The horizontal intercept is 25; that is the number of years after purchase that the tractor’s value is 0.