Solutions to Quadratic Practice

1. a) \( h = -\frac{-2}{4} = \frac{1}{2} \) \( k = -2(\frac{1}{4}) + 1 + 12 = 12.5 \)
The quadratic opens downward and \( k > 0 \) so it has 2 roots. Look in calculator.

b) \( h = -\frac{-6}{2} = -3 \) \( k = 9 - 18 + 10 = 1 \) \( V(-3, 1) \)
opens upward and \( k > 0 \) so no roots.

c) \( h = -\frac{-6}{2} = -3 \) \( k = 9 - 18 + 5 = -4 \) \( V(-3, -4) \)
opens upward, \( k < 0 \), 2 roots

d) \( h = -3 \) again \( k = 9 - 18 + 9 = 0 \) \( V(-3, 0) \)
f(x) = (x + 3)^2 one root

e) \( h = -\frac{-2}{2} = -1 \) \( k = -1 + 2 + 8 = 9 \) \( V(4, 9) \)
opens downward, \( k > 0 \) 2 roots

2. \( C(x) = 830 + 60x \) \( P(x) = 107 - 0.2x \) \( m = -\frac{6}{30} = \frac{-1}{5} \)
\( R(x) = -0.2x^2 + 107x \)
\( P(x) = -0.2x^2 + 47x - 830 \)
A good window is \([0, \frac{107}{5}] \times [0, 3]

b) Break-even at 19, 23378 and 215.7662
so round to 19 and 216.

c) \( h = -\frac{-47}{2} = 117.5 \) \( k = 1931.25 \)
quantity for max profit 117.5
max profit is $1931.25
d) at the quantity for maximum profit, the demand price is \( p(117.5) = 107 - 0.2(117.5) = 83.5 \) 

3. Demand line: \((x, p) = (\text{quantity, price})\) 
\((1000, 20)\) \( m = \frac{2}{100} = -0.02 \) 
\( p = -0.02(x - 1000) + 20 = -0.02x + 40 \) 

Supply line: \((670, 20)\) \((0, 13.30)\) 
\( m = \frac{6.70}{670} = 0.01 \) 
\( p = 0.01x + 13.30 \)

Equilibrium when \(-0.02x + 40 = 0.01x + 13.30\) 
\(26.70 = 0.03x\) 
\(x = 890\) 
\(p(890) = 0.01(890) + 13.30\) 
\(890 = x\) 
\(E(890, 22.20)\)