3. $R(p) = -4p^2 + 4000p$, $a = -4$, $b = 4000$, $c = 0$.

Since $a = -4 < 0$, the graph is a parabola that opens down, so the vertex is a maximum point. The maximum occurs at

$$p = \frac{-b}{2a} = \frac{-4000}{2(-4)} = 500$$ 3pts #3

Thus, the unit price should be \$500 for maximum revenue.

The maximum revenue is

$$R(500) = -4(500)^2 + 4000(500)$$
$$= -1000000 + 2000000$$
$$= \$1,000,000$$

2pts #7a

7. a. $a = -\frac{32}{2500}$, $b = 1$, $c = 200$. The maximum height occurs when

$$x = \frac{-b}{2a} = \frac{-1}{2(-32/2500)} = \frac{2500}{64} \approx 39 \text{ feet}$$

from base of the cliff.

b. The maximum height is

$$h(39.0625) = \frac{-32(39.0625)^2}{2500} + 39.0625 + 200$$
$$\approx 219.5 \text{ feet.}$$ 2pts #7b

c. Solving when $h(x) = 0$:

$$-\frac{32}{2500}x^2 + x + 200 = 0$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(-32/2500)(200)}}{2(-32/2500)}$$

$$x \approx \frac{-1 \pm \sqrt{11.24}}{-0.0256}$$ 2pts #7 c

$x \approx -91.90$ or $x \approx 170$

Since the distance cannot be negative, the projectile strikes the water approximately 170 feet from the base of the cliff.

13. a. $R(x) = 75x - 0.2x^2$

$a = -0.2$, $b = 75$, $c = 0$

The maximum revenue occurs when

$$x = \frac{-b}{2a} = \frac{-75}{2(-0.2)} = \frac{-75}{-0.4} = 187.5$$

The maximum revenue occurs when $x = 187$ or $x = 188$.

The maximum revenue is:

$$R(187) = 75(187) - 0.2(187)^2 = \$7031.20$$

$$R(188) = 75(188) - 0.2(188)^2 = \$7031.20$$

b. $P(x) = R(x) - C(x)$

$$= 75x - 0.2x^2 - (32x + 1750)$$
$$= -0.2x^2 + 43x - 1750$$

c. $P(x) = -0.2x^2 + 43x - 1750$

$a = -0.2$, $b = 43$, $c = -1750$

$$x = \frac{-b}{2a} = \frac{-43}{2(-0.2)} = \frac{-43}{-0.4} = 107.5$$

The maximum profit occurs when $x = 107$ or $x = 108$.

The maximum profit is:

$$P(107) = -0.2(107)^2 + 43(107) - 1750$$
$$= \$561.20$$

$$P(108) = -0.2(108)^2 + 43(108) - 1750$$
$$= \$561.20$$

d. Answers will vary.

We didn't spend much time on the $-\frac{b}{2a}$ method, like #7 shows (and all the rest). The emphasis in lecture & on the test is on other methods.