

# Math 10250

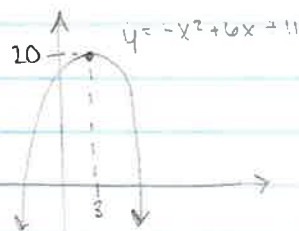
## Sample from HW2, 0.5: 1, 6, 9, 14, 22

✓ ①  $y = -x^2 + 6x + 11$

+  $= -(x^2 - 6x - 11)$   
 $= -(x^2 - 6x + 9 - 9 - 11)$   
 $= -((x-3)^2 - 20)$

$y = -(x-3)^2 + 20$

- graph opens downward
- vertex  $\rightarrow (3, 20)$
- $x=3$  is axis of symmetry

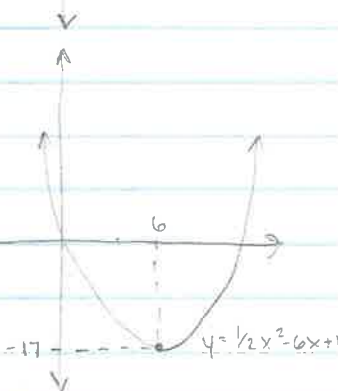


✓ ②  $y = \frac{1}{2}x^2 - 6x + 1$

+3  $= \frac{1}{2}(x^2 - 12x + 2)$   
 $= \frac{1}{2}(x^2 - 12x + 36 - 36 + 2)$   
 $= \frac{1}{2}((x-6)^2 - 34)$

$y = \frac{1}{2}(x-6)^2 - 17$

- graph opens upward
- vertex  $\rightarrow (6, -17)$
- $x=6$  is axis of symmetry



✓ ③  $f(x) = x^2 - 5x - 14$

+  $(x-7)(x+2)$

$x = 7, -2$

$\begin{array}{c} -14 \\ \times -2 \\ \hline 7 \end{array}$

$\begin{array}{c} + & -2 & - & 7 & + \\ x & = -3 & x & = 0 & x & = 8 \\ x-7 & < 0 & x-7 & < 0 & x-7 & > 0 \\ x+2 & < 0 & x+2 & > 0 & x+2 & > 0 \end{array}$

sg, positive on  $(-\infty, -2)$  and  $(7, \infty)$  negative on  $(-2, 7)$

✓ ④  $f(x) = 3x^2 + 5x - 2$

+  $= 3x^2 - x + 6x - 2$   
 $= (3x^2 - x) + (6x - 2)$   
 $= x(3x-1) + 2(3x-1)$   
 $= (3x-1)(x+2)$

$3 \cdot -2 = -6$     $-1 \cdot 6 = 6$   
 $5$     $-1 + 6 = 5$

$3x-1=0$   
 $3x=1$

$x = -2$   
 $x = 1/3$

$\begin{array}{c} + & -2 & - & 1/3 & + \\ x & = -3 & x & = 0 & x & = 1 \\ 3x-1 & < 0 & 3x-1 & < 0 & 3x-1 & > 0 \\ x+2 & < 0 & x+2 & > 0 & x+2 & > 0 \end{array}$

sg, positive on  $(-\infty, -2)$  and  $(1/3, \infty)$  negative on  $(-2, 1/3)$

✓ ⑤  $C(q) = 3,000 + 16q$

$q$  = dinners sold per month

+3  $q = 1,200 - 20p$

$p$  = average dinner price

a.)  $q + 20p = 1,200$

$\frac{20p}{20} = \frac{1,200 - q}{20}$

$R(q) = (60 - q/20)q = 60q - q^2/20 \rightarrow R(q) = 60q - q^2/20$

$p = \frac{1,200 - q}{20}$

$P(q) = R - C = (60q - q^2/20) - (3,000 + 16q)$

$= 60q - q^2/20 - 3,000 - 16q$

$p = 60 - q/20$

$P(q) = -q^2/20 + 44q - 3,000$

b.) when  $P=0$   $q = \frac{-44 \pm \sqrt{(44)^2 - 4(-1/20)(-3000)}}{2(-1/20)}$

$= -44 \pm \sqrt{1336}$

$= -10(-44 \pm \sqrt{1336})$

$\approx 805.5$  or  $74.5$

$-1/10$

Break-even points  $\uparrow$

$$* q = 1200 - 20p \quad C = 3000 + 16q$$

$$c.) C(p) = 3000 + 16(1200 - 20p)$$

$$= 3000 + 19200 - 320p$$

$$C(p) = 22200 - 320p$$

$$R(p) = 60(1200 - 20p) - (1200 - 20p)^2$$

$$= (72,000 - 1200p) - (20p^2 - 2400p + 72000)$$

$$= 72,000 - 1200p - 20p^2 + 2400p - 72000$$

$$R(p) = -20p^2 + 1200p$$

$$P(p) = \frac{-(-20p + 1200)^2 + 4(1200 - 20p) - 3000}{20}$$

$$= \frac{-(20p^2 - 2400p + 72000) + 52800 - 880p - 3000}{20}$$

$$= \frac{-20p^2 + 2400p - 72000 + 52800 - 880p - 3000}{20}$$

$$P(p) = -20p^2 + 1520p - 22200$$

$$0 = -20p^2 + 1520p - 22200$$

$$p = \frac{-1520 \pm \sqrt{(1520)^2 - 4(-20)(-22200)}}{2(-20)}$$

$$= \frac{-1520 \pm \sqrt{534400}}{-40} \approx 19.72 \text{ or } 56.28$$

-40

Break-even points

d.) A profit will be made between \$19.72 - \$56.28