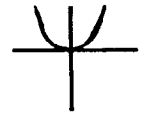
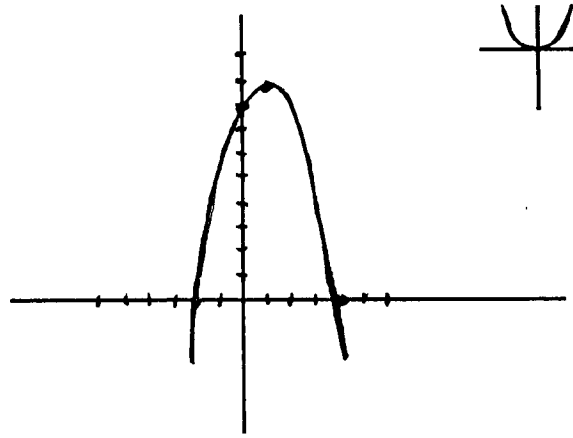
Graphing Quadratic Functions
Worksheet to Accompany Videotape #22

General shape: $y = x^2$



Example: $y = -x^2 + 2x + 8$



1. To find the vertex:

   $y = -(x^2-2x) + 8$
   $y = -(x^2-2x+1) + 8 + 1$
   $y = -(x-1)^2 + 9$
   Vertex (1, 9)

2. To find x-intercepts. Let $y = 0$
   Solve for x:

   $0 = -x^2 + 2x + 8$
   $0 = -(x^2 - 2x - 8)$
   $0 = -1(x-4)(x+2)$
   $x = 4,\ x = -2$
   (4, 0), (-2, 0)

   If you cannot factor, use the quadratic quadratic formula.
   If you get complex numbers, then there are no x-intercepts.

3. To find y-intercept. Let $x = 0$. Solve for y:
   $y = (-0)^2 + 2(0) + 8 = 8$ (0, 8)

For you to try:

I.
1. $f(x) = 2x^2 + 2$
2. $f(x) = \frac{1}{2}x^2 + 2$
3. $f(x) = 9 - 4x^2$
4. $f(x) = x^2 - 9$
5. $f(x) = -x^2 - 9$

II.
1. $f(x) = x^2 + 5x + 4$
2. $f(x) = 8x - 12 - x^2$
3. $f(x) = x^2 + x + 3$
4. $f(x) = 3x^2 - 12x + 16$
5. $f(x) = -x^2 + 3x + 4$
6. $f(x) = -5x^2 - 10x - 4$

Remember:
$y = ax^2$, $a > 1$ vertical stretch
$y = ax^2$, $0 < a < 1$ Vertical shrink
$y = ax^2$, $a < 0$ Reflection in the x-axis
$y = ax^2 + c$, move graph up
$y = ax^2 - c$, move graph down
$y = a(x-h)^2 + k$, (h, k) is vertex

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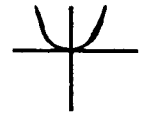

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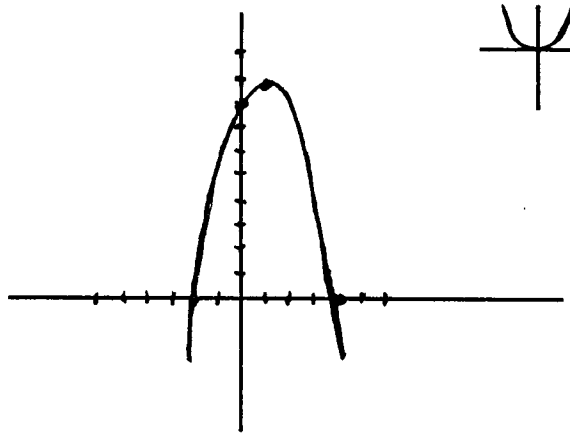

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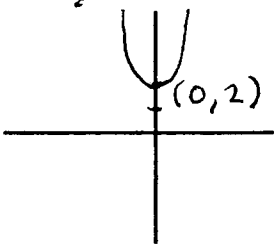
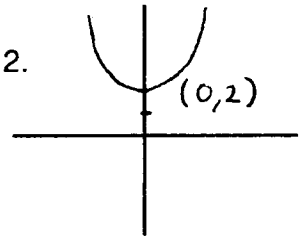
Tape #22, page 2
Answer Key

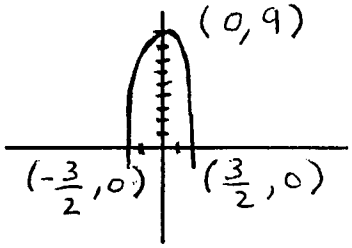
I. 1.



2.



3.



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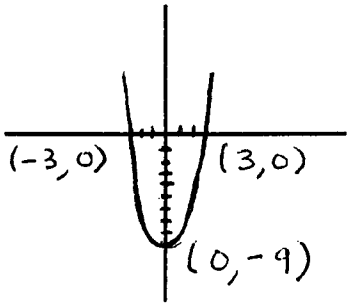
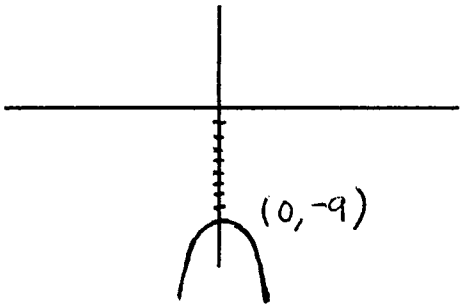


5.



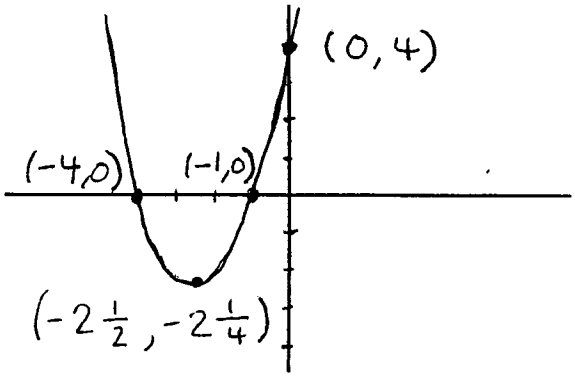
II. 1. $f(x) = x^2 + 5x + 4$

$= (x^2 + 5x + \frac{25}{4}) + 4 - \frac{25}{4}$

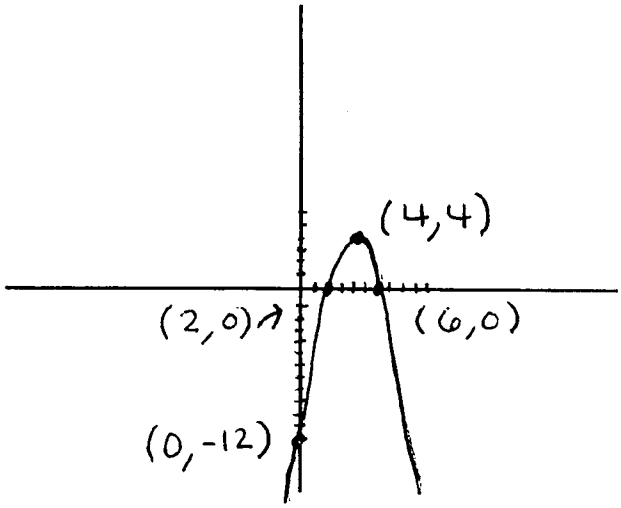
$= (x + \frac{5}{2})^2 - \frac{9}{4}$

vertex $(-\frac{5}{2}, -\frac{9}{4})$

y-int. (0,4)
x-int. (-4,0), (-1, 0)
$0 = x^2 + 5x + 4$
$= (x+4)(x+1)$
$x = -4, x = -1$



2. $f(x) = 8x - 12 - x^2$
$= -x^2 + 8x - 12$
$= -(x^2 - 8x + 16) - 12 + 16$
$= -(x-4)^2 + 4$
Vertex (4, 4)
y-int. (0, -12)
x-int. (6, 0)(2, 0)
$0 = -x^2 + 8x - 12$
$= -(x^2 - 8x + 12)$
$= -(x-6)(x-2)$
$x = 6, x = 2$



Tape #22, page 3
Answer Key

3. $f(x) = x^2 + x+3$

$= (x^2 + x + \frac{1}{4}) + 3 - \frac{1}{4}$

$= (x + \frac{1}{2})^2 + \frac{11}{4}$

vertex $(-\frac{1}{2}, \frac{11}{4})$

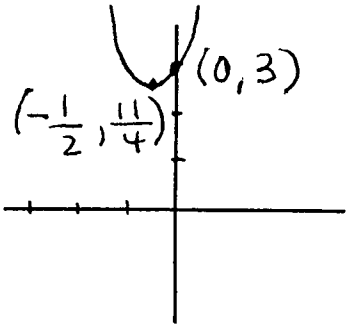
y-int. (0, 3)

x-int. none

$0 = x^2+x+3$

$x = \frac{-1 \pm \sqrt{1-4(1)(3)}}{2}$

$x = \frac{-1 \pm \sqrt{-11}}{2}$



4. $f(x) = 3x^2-12x+16$

$= 3(x^2-4x+4)+16-12$

$= 3(x-2)^2+4$

vertex (2, 4)

y-int. (0, 16)

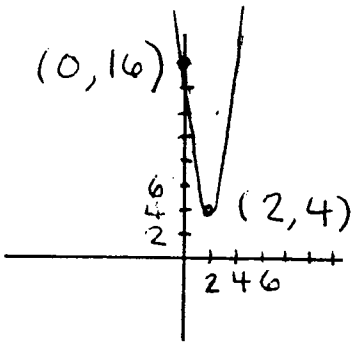
x-int. none

$0 = 3x^2-12x+16$

$x = \frac{12 \pm \sqrt{144-4(3)(16)}}{6}$

$= \frac{12 \pm \sqrt{144-192}}{6}$

$= \frac{12 \pm \sqrt{-48}}{6}$



5. $f(x) = -x^2+3x+4$

$= -(x^2 - 3x + \frac{9}{4}) + 4 + \frac{9}{4}$

$= -(x - \frac{3}{2})^2 + \frac{25}{4}$

vertex $(\frac{3}{2}, \frac{25}{4})$

y-int. (0, 4)

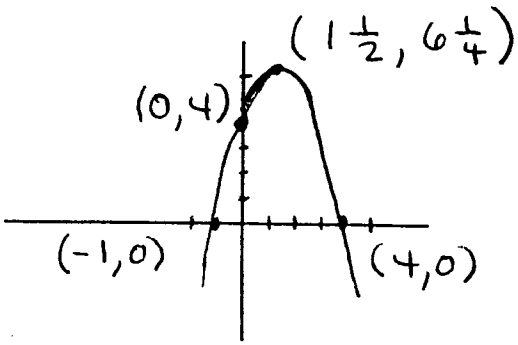
x-int. (4,0)(-1,0)

$0 = -x^2+3x+4$

$0 = -(x^2-3x-4)$

$0 = -(x-4)(x+1)$

$x = 4, \ x = -1$



Tape #22, page 4
Answer Key

6. $f(x) = -5x^2-10x-4$

$= -5(x^2+2x+1)-4+5$

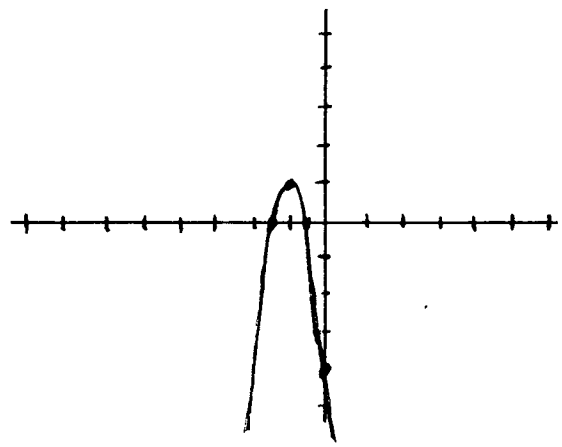
$= -5(x+1)^2+1$

vertex (-1,1)

y-int. (0, -4),

x-int. (-1.4,0), (-.6,0)

$0 = -5x^2-10x-4$



$$x = \frac{10 \pm \sqrt{100-4(-5)(-4)}}{-10}$$

$$= \frac{10 \pm \sqrt{100-80}}{-10}$$

$$= \frac{10 \pm \sqrt{20}}{-10}$$

$$= \frac{10 \pm 2\sqrt{5}}{-10}$$

$$= -1 \pm \frac{1}{5}\sqrt{5}$$

$$= -1 \pm .4$$

$x = -1.4$ or $x = -.6$