

11.6 cont'd p. 772

ex 16  $f(x) = -2x^2$   
 $a x^2$

opens downward  
 narrower

open up  $a > 0$   
 open down  $a < 0$   
 wider  $-1 < a < 1$   
 narrower  $a < -1$  or  $a > 1$   
 or like  $y = x^2$   $a = \pm 1$

ex 18  $f(x) = \frac{2}{3}x^2 - 4$

open upward  
 wider than  $y = x^2$

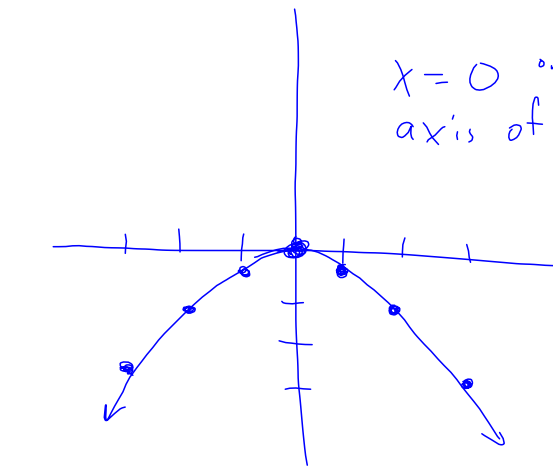
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Graph it, find vertex, find domain & range, & find axis of symmetry

ex 22

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

x	y
2	$-\frac{4}{3}$
1	$-\frac{1}{3}$
0	0
-1	$-\frac{1}{3}$
-2	$-\frac{4}{3}$
-3	-3

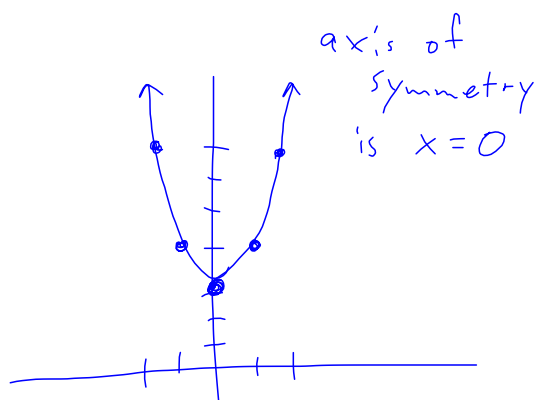


domain  $(-\infty, \infty)$   
 range  $(-\infty, 0]$

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ex24  $f(x) = x^2 + 3$   
 $y = x^2 + 3$

x	y
-3	12
-2	7
-1	4
0	3 ← Vertex
1	4
2	7
3	12



axis of symmetry is  $x=0$

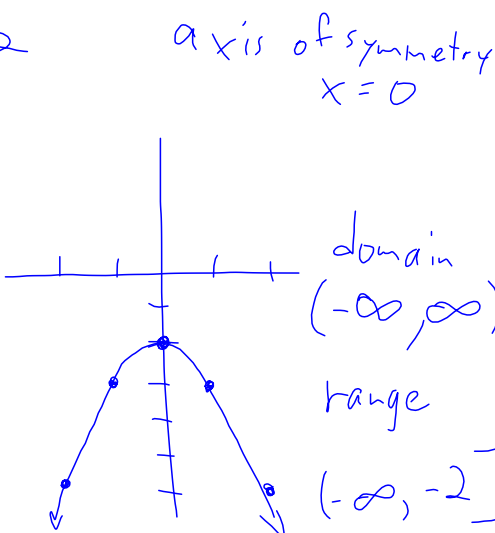
domain  $(-\infty, \infty)$

range  $[3, \infty)$

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ex26  $f(x) = -x^2 - 2$   
 $-1 \cdot x^2 - 2$

x	y
-2	-6
-1	-3
0	-2 ← vertex
1	-3
2	-6



axis of symmetry  $x=0$

domain  $(-\infty, \infty)$

range  $(-\infty, -2]$

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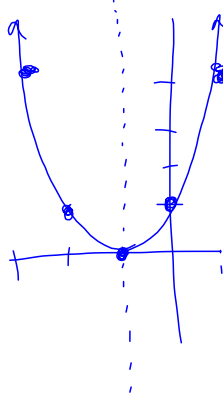
ex 28  $f(x) = (x+1)^2 + 0$

Vertex  $(-1, 0)$

axis of symmetry  $x = -1$

x	y
-2	1
-1	0
0	1
1	4

vertex



domain  $(-\infty, \infty)$

range  $[0, \infty)$

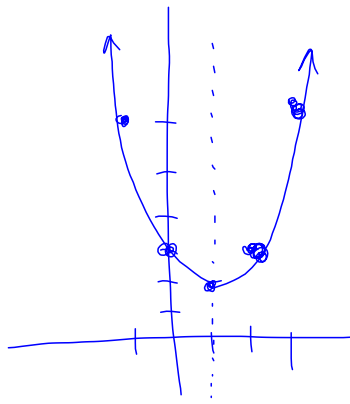
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ex 30  $f(x) = (x-1)^2 + 2$

Vertex  $(1, 2)$

axis of symmetry  $x = 1$

x	y
-2	11
-1	6
0	3
1	2
2	3
3	6
4	11



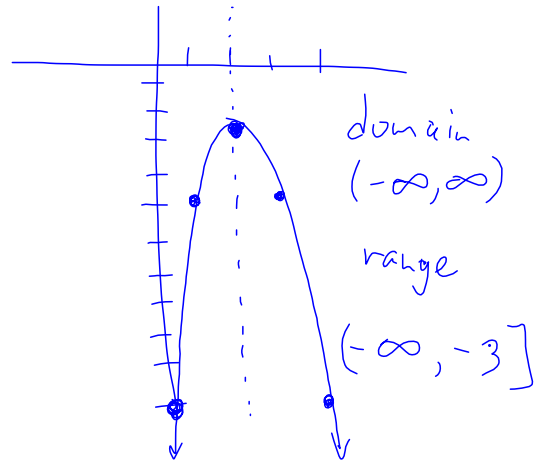
domain  $(-\infty, \infty)$

range  $[2, \infty)$

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ex 34  $f(x) = -2(x - 2)^2 - 3$  axis of symm.  $x = 2$   
 Vertex  $(2, -3)$

x	y
0	-11
1	-5
2	-3 ← vertex
3	-5
4	-11

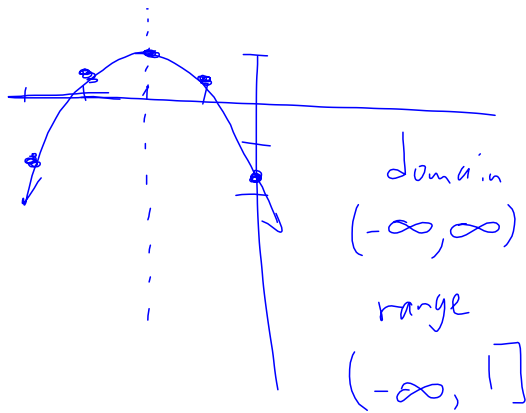


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ex 36  $f(x) = -\frac{2}{3}(x + 2)^2 + 1$  axis of symm.  $x = -2$   
 Vertex  $(-2, 1)$

x	y
0	$-\frac{5}{3}$
-1	$\frac{1}{3}$
-2	1 ← vertex
-3	$\frac{1}{3}$

$\frac{4}{1} \cdot \frac{-2}{3} \rightarrow \frac{-8}{3} + 1$



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Find the vertex

ex 8  $f(x) = x^2 + 10x + 23$

axis of sym. is  $x = -5$

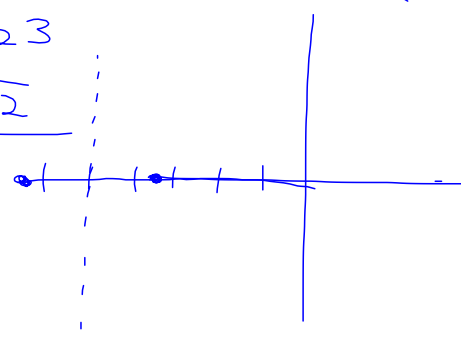
find  $\rightarrow 0 = x^2 + 10x + 23$

x intercepts  $x = \frac{-10 \pm \sqrt{100 - 92}}{2}$

axis of symmetry  $x = \frac{-10 \pm \sqrt{8}}{2}$

$x = \frac{-B}{2A}$

$\frac{-10 \pm 2.8}{2}$   
 $\rightarrow -3.6$   
 $\rightarrow -6.4$



Vertex  $(-5, -2)$

$$\begin{aligned} f(-5) &= (-5)^2 + 10(-5) + 23 \\ &= 25 - 50 + 23 \\ &= -2 \end{aligned}$$

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ex 10  $f(x) = -3x^2 + 12x - 8$

$$x = \frac{-B}{2A} = \frac{-12}{2(-3)} = \frac{-12}{-6} = 2$$

axis of sym.  $x = 2$

$V(2, 4)$

$$-3(2)^2 + 12(2) - 8$$

$$-3(4) + 24 - 8$$

$$-12 + 24 - 8$$

$$4$$

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ex 12

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

$$x = \frac{-B}{2A} = \frac{1}{2}$$

Vertex  $(\frac{1}{2}, 4\frac{3}{4})$

$$\begin{aligned} &(\frac{1}{2})^2 - \frac{1}{2} + 5 \\ &\frac{1}{4} - \frac{1}{2} + 5 \\ &-\frac{1}{4} + 5 \\ &4\frac{3}{4} \end{aligned}$$

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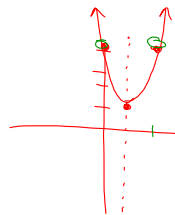
ex 14

$$f(x) = 3x^2 - 6x + 4$$

axis:  $x = \frac{-B}{2A} = \frac{6}{6} = 1$

Vertex  $(1, 1)$   $3 \cdot 1^2 - 6 \cdot 1 + 4$   
 $3 - 6 + 4 = 1$

x	y	
-1	13	$3 + 6 + 4$
0	4	
1	1	vertex
2	4	$12 - 12 + 4$
3	13	$27 - 18 + 4$



$c = 4 \rightarrow (0, 4)$  yint

$$4 = 3x^2 - 6x + 4$$

$$0 = 3x^2 - 6x$$

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

$\downarrow$                      $\downarrow$   
 $x = 0$                  $x = 2$

$V(1, 1)$

$$f(x) = 3x^2 - 6x + 4$$

↑  
open up & narrower

$$B^2 - 4AC$$

$36 - 48$  negative

imaginary x intercepts  
no real x intercept pts

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ex 16  $f(x) = -x^2 + 7x + 2$

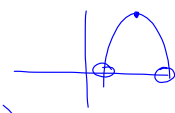
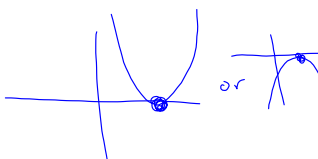
$x = -\frac{B}{2A} = \frac{-7}{-2} = \frac{7}{2}$

Vertex  $(\frac{7}{2}, \frac{57}{4})$

open down  
same width as  $y = x^2$

$B^2 - 4AC$   
 $49 + 8 = 57$   
2 real irrational #s

If  $B^2 - 4AC = 0$   
one x-intercept

$-\frac{49}{4} + \frac{49}{2} + 2 =$   
 $-\frac{49}{4} + \frac{98}{4} + \frac{8}{4} = \frac{57}{4}$

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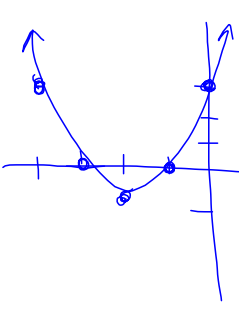
ex 28  $f(x) = x^2 + 4x + 3$

axis of symm.  $x = -\frac{B}{2A} = \frac{-4}{2} = -2$

Vertex  $(-2, -1)$

$4 - 8 + 3$

x	y	
0	3	
-1	0	$1 - 4 + 3$
-2	-1	vertex
-3	0	$9 - 12 + 3$
-4	3	



domain  $(-\infty, \infty)$

range  $[-1, \infty)$

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$$y = x^2 + 4x + 3$$

$$y = x^2 + 4x + \frac{+4}{+4} + 3 - \frac{4}{4}$$

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

$$V(-2, -1)$$

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