Parabola Graphing Practice

Math 130 *Kovitz*

To aid in the graphing of each given quadratic equation, find:

- the vertex and whether it is a maximum or a minimum point;
- the convexity (whether it opens up or down);
- the shape: narrow, flat (meaning less steep than baseline), or baseline;
- the equation (or the name) of the line of symmetry;
- the coordinates of all intercepts;
- the quadrants with points on the graph.

Then draw a rough graph and label the points and line found with their coordinates or equation.

1. $f(x) = x^2 + 1$
2. $f(x) = x^2 + x + 1$
3. $f(x) = x^2 - \sqrt{11}x$
4. $f(x) = x^2 - 6x + 2$
5. $f(x) = x^2 + 2x + 2$
6. $f(x) = -x^2 + 10x + 7$
7. $f(x) = -2x^2 + 20x - 63$
8. $f(x) = -5x^2 + 14x + 16$
9. $f(x) = -16x^2 + 44x - 18$
10. $f(x) = -3x^2 + 3x - 3/4$
11. $f(x) = 2/3x^2 + 3x + 1$
12. $f(x) = \frac{1}{2}x^2 + \frac{1}{4}x + \frac{1}{8}$
13. $f(x) = 4x^2 + 2x - 2$
14. $f(x) = \sqrt{2}x^2 + 4x + 5$

Answers to graph-aid questions below

Answers (graphs not shown)

1. Min at $(0,\ 1)$; baseline shape, opens up; l.o.s. the y-axis; only intercept is $(0,\ 1)$; quadrants 1 and 2.

2. Min at $(-1/2,\ 3/4)$; baseline shape, opens up; l.o.s. $x = -1/2$; only intercept is $(0,\ 1)$; quadrants 1 and 2.

3. Min at $\left(\frac{\sqrt{11}}{2},\ -\frac{11}{4}\right)$; baseline shape, opens up; l.o.s. $x = \frac{\sqrt{11}}{2}$; $(0, 0)$ and $\left(\sqrt{11},\ 0\right)$; quadrants 1, 2, and 4.

4. Min at $(3, -7)$; baseline shape, opens up; l.o.s. $x = 3$; $(0, 2)$, $\left(3 - \sqrt{7},\ 0\right)$ and $\left(3 + \sqrt{7},\ 0\right)$; quadrants 1, 2, and 4.

5. Min at $(-1,\ 1)$; baseline shape, opens up; l.o.s. $x = -1$; only intercept is $(0, 2)$; quadrants 1 and 2.

6. Max at $(5,\ 32)$; baseline shape, opens down; l.o.s. $x = 5$; $(0,\ 7)$, $\left(5 - 4\sqrt{2},\ 0\right)$ and $\left(5 + 4\sqrt{2},\ 0\right)$; all four quadrants.

7. Max at $(5, -13)$; narrow, opens down; l.o.s. $x = 5$; only intercept is $(0,\ -63)$; quadrants 3 and 4.

8. Max $(7/5,\ 129/5) = (1.4,\ 25.8)$; narrow, down; l.o.s. $x = 7/5$; $(0, 16)$, $\left(\frac{7-\sqrt{129}}{5},\ 0\right)$ and $\left(\frac{7+\sqrt{129}}{5},\ 0\right)$; all quadrants.

9. Max $(11/8,\ 49/4) = (1.375,\ 12.25)$; narrow, down; l.o.s. $x = 11/8$; $(0, -18)$, $(1/2,\ 0)$ and $(9/4,\ 0)$; Q: 1, 3, and 4.

10. Max at $(1/2,\ 0)$; narrow, opens down; l.o.s. $x = 1/2$; $(0, -3/4)$, and $(1/2,\ 0)$ (tangent to x-axis); quadrants 3 and 4.

11. Min at $(-9/4,\ -19/8) = (-2.25,\ -2.375)$; flat, up; l.o.s. $x = -9/4$; (0.1), $\left(\frac{-9-\sqrt{57}}{4},\ 0\right)$ and $\left(\frac{-9+\sqrt{57}}{4},\ 0\right)$; Q: 1, 2, and 4.

12. Min at $(-1/4,\ 3/32) = (-0.25,\ 0.09375)$; flat, up; l.o.s. $x = -1/4$; only intercept is $(0,\ 1/8)$; quadrants 1 and 2.

13. Min at $(-1/4,\ -9/4)$; narrow, opens up; l.o.s. $x = -1/4$; $(0, -2)$, $(-1,\ 0)$ and $(1/2,\ 0)$; all four quadrants.

14. Min at $(-\sqrt{2},\ \ 5 - 2\sqrt{2})$; narrow, opens up; l.o.s. $x = -\sqrt{2}$; only intercept is $(0,\ 5)$; quadrants 1 and 2.