Preface

Here are a set of problems for my Algebra notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.
Common Graphs

Introduction

Here are a set of problems for which no solutions are available. The main intent of these problems is to have a set of problems available for any instructors who are looking for some extra problems.

Note that some sections will have more problems than others and some will have more or less of a variety of problems. Most sections should have a range of difficulty levels in the problems although this will vary from section to section.

Here is a list of topics in this chapter that have problems written for them.

- **Lines, Circles and Piecewise Functions**
- **Parabolas**
- **Ellipses**
- **Hyperbolas**
- **Miscellaneous Functions**
- **Transformations**
- **Symmetry**
- **Rational Functions**

**Lines, Circles and Piecewise Functions**

We looked at these topics in the previous chapter. Problems for these topics can be found in the following sections.

- Lines : Graphing and Functions – [Lines](#)
- Circles : Graphing and Functions – [Circles](#)
- Piecewise Functions : Graphing and Functions – [Graphing Functions](#)

**Parabolas**

For problems 1 – 18 sketch the graph of the following parabolas. The graph should contain the vertex, the \( y \)-intercept, \( x \)-intercepts (if any) and at least one point on either side of the vertex.

1. \( f(x) = -4x^2 \)
2. \( f(x) = (x - 6)^2 + 1 \)

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

4. \( f(x) = 3(x - 1)^2 + 12 \)

5. \( f(x) = -6(x + 5)^2 + 54 \)

6. \( f(x) = -(x - 7)^2 - 3 \)

7. \( f(x) = 2(x + 3)^2 - 6 \)

8. \( f(x) = x^2 - 8 \)

9. \( f(x) = -4x^2 - 1 \)

10. \( f(x) = x^2 - 16x + 55 \)

11. \( f(x) = x^2 - 2x + 5 \)

12. \( f(x) = 4x^2 + 16x \)

13. \( f(x) = x^2 + 10x + 25 \)

14. \( f(x) = -2x^2 + 24x - 64 \)

15. \( f(x) = 3x^2 + 6x - 12 \)

16. \( f(x) = -4x^2 + 12x - 9 \)

17. \( f(x) = -x^2 + 6x - 16 \)

18. \( f(x) = x^2 + 8x + 5 \)

For problems 19 – 25 convert the following equations into the form \( y = a(x - h)^2 + k \).
19. \( f(x) = x^2 + 4x \)

20. \( f(x) = x^2 - 6x + 19 \)

21. \( f(x) = -x^2 + 2x + 6 \)

22. \( f(x) = 7x^2 + 56x + 111 \)

23. \( f(x) = 3x^2 - 60x + 306 \)

24. \( f(x) = 25x^2 + 10x + 1 \)

25. \( f(x) = -2x^2 - 16x - 18 \)

**Ellipses**

For problems 1 – 7 sketch the ellipse.

1. \( \frac{(x+5)^2}{4} + \frac{(y-2)^2}{9} = 1 \)

2. \( (x-4)^2 + \frac{y^2}{16} = 1 \)

3. \( \frac{(x+1)^2}{25} + \frac{(y+6)^2}{4} = 1 \)

4. \( \frac{(x-3)^2}{5} + \frac{(y+1)^2}{12} = 1 \)

5. \( 9(x-2)^2 + 4(y-3)^2 = 1 \)

6. \( \frac{(x-3)^2}{9} + 2(y+4)^2 = 1 \)

7. \( \frac{(x-4)^2}{9} + \frac{(y-1)^2}{9} = 1 \)
For problems 8 – 10 complete the square on the \(x\) and \(y\) portions of the equation and write the equation into the standard form of the equation of the ellipse.

8. \(4x^2 - 16x + y^2 + 2y + 13 = 0\)

9. \(x^2 + 6x + 4y^2 + 16y + 9 = 0\)

10. \(5x^2 + 10x + 3y^2 - 6y - 7 = 0\)

Hyperbolas

For problems 1 – 5 sketch the hyperbola.

1. \(\frac{x^2}{9} - \frac{y^2}{4} = 1\)

2. \(\frac{(y+3)^2}{36} - \frac{(x+2)^2}{16} = 1\)

3. \(\frac{(y-5)^2}{49} - \frac{x^2}{64} = 1\)

4. \(9(x-4)^2 - \frac{(y-1)^2}{4} = 1\)

5. \(\frac{1}{25}(y+1)^2 - 15(x-3)^2 = 1\)

For problems 6 – 8 complete the square on the \(x\) and \(y\) portions of the equation and write the equation into the standard form of the equation of the hyperbola.

6. \(9x^2 - 4y^2 + 48y - 180 = 0\)

7. \(y^2 - 6y - 4x^2 - 8x - 11 = 0\)

8. \(7x^2 - 28x - 4y^2 + 40y - 100 = 0\)

Miscellaneous Functions
The sole purpose of this section was to get you familiar with the basic shape of some miscellaneous functions for the next section. As such there are no problems for this section. You will see quite a few problems utilizing these functions in the Transformations section.

Transformations

Use transformations to sketch the graph of the following functions.

1. \( f(x) = |x| - 4 \)
2. \( f(x) = \sqrt{x} + 3 \)
3. \( f(x) = x^2 + 7 \)
4. \( f(x) = \sqrt{x} + 2 \)
5. \( f(x) = (x + 3)^2 \)
6. \( f(x) = |x - 1| \)
7. \( f(x) = -|x| \)
8. \( f(x) = -\sqrt{x} \)
9. \( f(x) = (-x)^3 \)
10. \( f(x) = |-x| \)
11. \( f(x) = \sqrt{x - 2} - 3 \)
12. \( f(x) = (x + 1)^2 - 4 \)
13. \( f(x) = |x + 2| + 4 \)
14. \( f(x) = (x - 5)^3 + 2 \)
Symmetry

Determine the symmetry of each of the following equations.

1. \( x^3 + 5y^3 = 2y \)

2. \( y + 4y^2 = 5x^3 + 1 \)

3. \( y^2 = 8x^4 + \frac{x^2}{y^2} - 1 \)

4. \( y = 4x^2 - 7x + 1 \)

5. \( y = 5|x| + 8 \)

6. \( x = 9 - 4y^2 \)

7. \( y^4 + 8y^2 = 5x - 1 \)

8. \( x^2 - 4xy + y^2 = 1 \)

9. \( y = \frac{x^2}{x^2 + 1} \)

Rational Functions

Sketch the graph of each of the following functions. Clearly identify all intercepts and asymptotes.

1. \( f(x) = \frac{7}{5x + 10} \)

2. \( f(x) = \frac{6 - x}{x - 3} \)

3. \( f(x) = \frac{8x + 6}{4 - 2x} \)

4. \( f(x) = \frac{-2}{x^2 - 5x} \)

5. \( f(x) = \frac{x + 3}{x^2 + 4x - 5} \)
6. \( f(x) = \frac{2}{x^2 - x - 12} \)

7. \( f(x) = \frac{5x^2 + 1}{2x^2 - 32} \)

8. \( f(x) = \frac{x^2 - 5x + 4}{x^2 + 2x - 15} \)