EXERCISES

Determine whether the graph (parabola) of each quadratic function opens upward or downward.

1. $y=-5x^2$
2. $y=5x^2$
3. $y=x^2-2$
4. $f(x)=x^2+2$
5. $f(x)=-2(x-3)(x+1)$
6. $f(x)=x^2-2x+1$
7. $f(x)=3(x+1)(x-2)$
8. $f(x)=-2(x-1)^2$
9. $f(x)=-12+3x^2$

Determine how many $x-$intercepts each quadratic function has by using the discriminant b^2-4ac.

10. $y=2x^2-4x+2$
11. $y=x^2-4x-3$
12. $y=x^2+2x+1$
13. $y=x^2-3x+6$
14. $y=x^2-6x-3$
15. $y=2x^2$
16. $f(x)=-2x^2$
17. $f(x)=2x^2+4$
18. $f(x)=2x^2-4$
19. $f(x)=-2x^2+4x+1$
20. $f(x)=-3x^2+6x-5$
21. $f(x)=3-6x+3x^2$

Find the $x-$intercepts (zeros) of each quadratic function. Round answers to the nearest tenth when necessary.

22. $y=x^2-x-6$
23. $y=x^2+x-6$
24. $y=x^2-5x-6$
25. $y=(x+6)(x-1)$
26. $y=(x-7)(x+4)$
27. $y=x^2+12x+35$
28. $f(x)=2x^2-4x+2$
29. $f(x)=-2x^2+4x+1$
30. $f(x)=3(x-2)(x+2)$
31. $f(x)=-2x^2-5$
32. $f(x)=x^2-4x-3$
33. $f(x)=3x^2-5x-1$

Find the vertex (h, k) of each parabola by using the form $f(x)-k=a(x-h)^2$.

34. $y-5=2(x-7)^2$
35. $y-1=(x-4)^2$
36. $y+4=3(x-2)^2$
37. $y+1=(x+4)^2$
38. $y+5=2(x-7)^2$
39. $y-4=3(x+2)^2$
40. $f(x)=3(x-4)^2-2$
41. $f(x)=(x-5)^2-1$
42. $f(x)=3(x+4)^2-2$
43. $f(x)=(x+5)^2-1$
44. $f(x)=(x+7)^2+9$
45. $f(x)=5(x-6)^2+12$
46. $f(x)-4=-6(x+12)^2$
47. $f(x)=-(x-1)^2-7$
48. $f(x)=\frac{1}{2}(x-10)^2-9$
49. $f(x)=3x^2+12$
50. $f(x)+7=-5x^2$

Find the vertex (h, k) of each parabola.

51. $y=x^2+4x+4$
52. $y=x^2-4x+4$
53. $y=x^2+4x+9$
54. $f(x)=x^2-4x-1$
55. $f(x)=x^2-6x+7$
56. $f(x)=x^2+6x+11$
57. $f(x)=x^2-2x-4$
58. $f(x)=x^2-10x+13$
59. $f(x)=x^2+14x+58$
60. $f(x)=x^2+10x+24$
61. $f(x)=3x^2-12x+8$
62. $f(x)=2x^2+16x+34$

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Find the vertex and zeros (x-intercepts). Then graph each parabola.

63. $f(x)=\frac{1}{2}x^2$ **64.** $f(x)=-\frac{1}{2}x^2$ **65.** $f(x)=x^2+1$

66. $f(x)=-x^2+2$ **67.** $f(x)=(x-1)^2$ **68.** $f(x)=(x+1)^2$

69. $f(x)=2(x-2)^2$ **70.** $f(x)=(x-3)^2+1$ **71.** $f(x)=2(x-3)^2+1$

72. $f(x)=(x+3)(x+1)$ **73.** $f(x)=(x+3)(x-1)$ **74.** $f(x)=x^2+2x+2$

75. Find k so that the equation $9x^2+30x+k=0$ has one real-number root.

76. Find k so that the equation $5x^2-3x-k=0$ has two real-number roots.

77. Find k so that the equation $4kx^2+2x-5=0$ has no real-number root.

Compare each graph to the graph of $y=x^2$, describe the shift of the graph.

78. $y=x^2+1$ **79.** $y=(x+1)^2$ **80.** $y=(x-2)^2-3$

81. Determine how many x-intercepts the quadratic function has. (Hint: $D=b^2-4ac$)

a. $y=4x^2+4x+1$ **b.** $y=4x^2-5x+2$ **c.** $y=2x^2-7x-3$

82. Find the extreme value (maximum or minimum) of $y=2x^2-8x-1$.

83. Find the extreme value (maximum or minimum) of $y=-2x^2+8x+10$.

84. Find the dimension of the rectangle of greatest area whose perimeter is $160\,cm$.

85. Find the maximum profit if the equation of profit is $p(x)=2+8x-x^2$, where $p(x)$ is the profit and x is the number of products sold.

86. A projectile is fired vertically upward with an initial speed of 128 feet per second. The height of the projectile is given by $h(t)=vt-16t^2$, where v is the initial speed and t is the time in seconds. What will be the maximum height of the rocket reaches ?

87. A rocket is fired vertically upward from the top of a tower 224 feet high with an initial upward speed of 208 feet per second. The height of the rocket is given by the formula $h(t)=224+vt-16t^2$, where v is the initial speed and t is the time in seconds. What is the maximum height of the rocket reaches ?

88. A rocket is fired from the top of a tower 100 feet high with an initial speed of 208 feet per second and at an angle of 45 degree to the horizontal. The height h in feet of the rocket above the level ground is given by $h(x)=-0.00074x^2+x+100$, where x is the horizontal distance from the base of the tower. a) Find the maximum height of the rocket. b) How far (the x value) will the rocket reach the ground ?

89. An open box is to be made from a cardboard. The width of the cardboard is 5 inches less than the length by cutting 4-inch squares from each corner and folding up the sides. If the volume of the box is 336 cubic inches, find the dimensions of the original cardboard

90. A rectangular garden is to be enclosed by a 80 meters of fencing. One side of which will be against the side of a house. Find the dimensions of the garden to obtain a maximum area.

91. Two adjacent rectangular garden is to be enclosed by a 400 meters of fencing. Find the dimensions of the garden to obtain a maximum area.