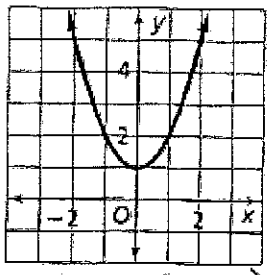
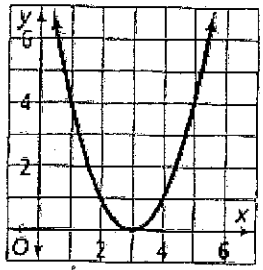
Quadratics Review Name: Hirsch

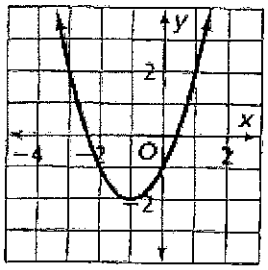
Identify the vertex and the axis of symmetry of each parabola.

7. 

vertex (0,1)
AOS $x=0$

8. 

vertex (3,0)
AOS $x=3$

9. 

vertex (-1,-2)
AOS $x=-1$

Factor each quadratic equation. Identify x- and y-intercepts.

1. $y = x^2 + 5x - 14$ (y-int)

$a \cdot c = -14$: $-2 \wedge 7$

$y=(x-2)(x+7)$

$x-2=0 \quad x+7=0$

$x=2 \quad x=-7$

x-int (2,0) & (-7,0)
y-int (0,-14)

2. $y = x^2 - 16x + 64$

$a \cdot c = 64$: $-8 \wedge -8$

$y=(x-8)(x-8)$

$x-8=0$

$x=8$

x-int (8,0)
y-int (0,64)

3. $y = 2x^2 - 5x - 3$

$\frac{2x^2}{2x} - \frac{6x}{2x} + \frac{1x}{1} - \frac{3}{1}$

$2x(x-3)1(x-3)$

$y=(2x+1)(x-3)$

$a \cdot c = -6$: $-6 \wedge 1$

$2x+1=0 \quad x-3=0$

$2x=-1 \quad x=3$

$x=1/2$

x-int (1/2,0) & (3,0)
y-int (0,-3)

4. $y = 3x^2 - 2x - 5$

$\frac{3x^2}{x} - \frac{5x}{x} + \frac{3x}{1} - \frac{5}{1}$

$x(3x-5)1(3x-5)$

$y=(3x-5)(x+1)$

$a \cdot c = -15$: $-5 \wedge 3$

$3x-5=0 \quad x+1=0$

$3x=5 \quad x=-1$

$x=5/3$

x-int (5/3,0) & (-1,0)
y-int (0,-5)

5. $y = x^2 - 3x - 18$

$y=(x-6)(x+3)$

$x-6=0 \quad x+3$

$x=6 \quad x=-3$

x-int (6,0) & (-3,0)
y-int (0,-18)

$a \cdot c = -18$: $-6 \wedge 3$

6. $y = x^2 - 13x + 12$

$y=(x-1)(x-12)$

$x-1=0 \quad x-12=0$

$x=1 \quad x=12$

x-int (1,0) & (12,0)
y-int (0,12)

$a \cdot c = 12$: $-1 \wedge -12$

7. $y = 4x^2 + 13x + 3$

$a \cdot c = 12 < \frac{12}{1}$

$\frac{4x^2}{4x} + \frac{12x}{4x} + \frac{1x}{1} + \frac{3}{1}$

$4x(x+3)1(x+3)$ $y=(4x+1)(x+3)$

x-int (-1/4,0) & (-3,0)
y-int (0,3)

$4x+1=0 \quad x+3=0$

$4x=-1 \quad x=-3$

$x=-1/4$

8. $y = x^2 - 8x + 15$

$a \cdot c = 15$: $-3 \wedge -5$

$y=(x-3)(x-5)$

$x-3=0 \quad x-5=0$

$x=3 \quad x=5$

x-int (3,0) & (5,0)
y-int (0,15)

9. $y = 2x^2 - 13x + 6$

$\frac{2x^2}{x} - \frac{x}{x} - \frac{12x}{} + 6$

$x(2x-1)$

$a \cdot c = 12$: $-1 \wedge -12$

10. $x^2 - 81$

$(x+9)(x-9)$

$x+9=0 \quad x-9=0$

$x=-9 \quad x=9$

x-int (-9,0) & (9,0)
y-int (0,-81)

Find the vertex of the following (algebraically):

9. $y = x^2 + 4x - 6$

$x = \frac{opp\,b}{2a} = \frac{-4}{2(1)} = -2$

$y = (-2)^2 + 4(-2) - 6 = -10$

vertex $(-2, -10)$

10. $y = x^2 - 6x + 6$

$x = \frac{6}{2(1)} = 3$

$y = (3)^2 - 6(3) + 6 = -3$

vertex $(3, -3)$

11. $y = 4x^2 + 8x - 4$

$x = \frac{-8}{2(4)} = \frac{-8}{8} = -1$

$y = 4(-1)^2 + 8(-1) - 4 = -8$

vertex $(-1, -8)$

12. $y = 4x^2 + 4x + 1$

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

$y = 4\left(-\frac{1}{2}\right)^2 + 4\left(-\frac{1}{2}\right) + 1 = 0$

vertex $\left(-\frac{1}{2}, 0\right)$

13. $y = 2x^2 + 4x - 5$

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

$y = 2(-1)^2 + 4(-1) - 5 = -7$

vertex $(-1, -7)$

14. $y = -3x^2 - 4x - 1$

$x = \frac{4}{2(-3)} = \frac{4}{-6}$

$y = -3\left(\frac{4}{-6}\right)^2 + 4\left(\frac{4}{-6}\right) - 1 = \frac{-5}{3}$

vertex $\left(-\frac{4}{6}, -\frac{5}{3}\right)$

15. $y = -3x^2 + 3x - 1$

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

$y = -3\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right) - 1 =$

$= -3.25$

vertex $\left(\frac{1}{2}, -3.25\right)$

16. $y = x^2 + 2x + 1$

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

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

$= 0$

vertex $(-1, 0)$

17. $y = -5x^2 + 10x + 1$

$x = \frac{-10}{2(-5)} = 1$

$y = -5(1)^2 + 10(1) + 1$

$= 6$

vertex $(1, 6)$

Evaluate the discriminant of each equation. Tell how many solutions each equation has and whether the solutions are real or imaginary. $b^2 - 4ac$

1. $y = x^2 + 10x - 25$

$a = 1 \quad b = 10 \quad c = -25$

$(10)^2 - 4(1)(-25)$

200

2 Real Roots

2. $y = x^2 + 10x + 10$

$a = 1 \quad b = 10 \quad c = 10$

$(10)^2 - 4(1)(10)$

60

2 Real Roots

3. $y = 9x^2 - 24x$

$a = 9 \quad b = -24 \quad c = 0$

$(-24)^2 - 4(9)(0)$

576

2 Real Roots

4. $y = 4x^2 - 4x + 1$

$a = 4 \quad b = -4 \quad c = 1$

$(-4)^2 - 4(4)(1)$

0

1 Real Root

5. $y = 4x^2 - 5x + 1$

$a = 4 \quad b = -5 \quad c = 1$

$(-5)^2 - 4(4)(1)$

9

2 Real Roots

6. $y = 4x^2 - 3x + 1$

$a = 4 \quad b = -3 \quad c = 1$

$(-3)^2 - 4(4)(1)$

-7

0 Real Roots

Solve each equation using the Quadratic Formula.

16. $x^2 + 6x + 9 = 0$

$a=1\ b=6\ c=9$

$x = \frac{-6 \pm \sqrt{(6)^2-4(1)(9)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{0}}{2}$

$\frac{-6+\sqrt{0}}{2} = -3$ $\frac{-6-\sqrt{0}}{2} = -3$

17. $x^2 - 15x + 56 = 0$

$a=1\ b=-15\ c=56$

$x = \frac{15 \pm \sqrt{(-15)^2-4(1)(56)}}{2(1)}$

$x = \frac{15 \pm \sqrt{1}}{2}$

$\frac{15+\sqrt{1}}{2} = 8$ $\frac{15-\sqrt{1}}{2} = 7$

18. $3x^2 - 5x + 2 = 0$

$a=3\ b=-5\ c=2$

$x = \frac{5 \pm \sqrt{(-5)^2-4(3)(2)}}{2(3)}$

$x = \frac{5 \pm \sqrt{1}}{6}$

$\frac{5+\sqrt{1}}{6} = 1$ $\frac{5-\sqrt{1}}{6} = \frac{4}{6} = .6667$

19. $2x^2 + 3x + 5 = 0$

$a=2\ b=3\ c=5$

$x = \frac{-3 \pm \sqrt{(3)^2-4(2)(5)}}{2(2)}$

$x = \frac{-3 \pm \sqrt{-31}}{4}$

NO real roots

20. $10x^2 - 23x + 12 = 0$

$a=10\ b=-23\ c=12$

$x = \frac{23 \pm \sqrt{(-23)^2-4(10)(12)}}{2(10)}$

$x = \frac{23 \pm \sqrt{49}}{20}$

$\frac{23+\sqrt{49}}{20} = 1.5$ $\frac{23-\sqrt{49}}{20} = 0.8$

21. $4x^2 + x - 5 = 0$

$a=4\ b=1\ c=-5$

$x = \frac{-1 \pm \sqrt{(1)^2-4(4)(-5)}}{2(4)}$

$x = \frac{-1 \pm \sqrt{81}}{8}$

$\frac{-1+\sqrt{81}}{8} = 1$ $\frac{-1-\sqrt{81}}{8} = -1.25$

22. $x^2 + 8x + 15 = 0$

$a=1\ b=8\ c=15$

$x = \frac{-8 \pm \sqrt{(8)^2-4(1)(15)}}{2(1)}$

$x = \frac{-8 \pm \sqrt{4}}{2}$

$\frac{-8+\sqrt{4}}{2} = -3$ $\frac{-8-\sqrt{4}}{2} = -5$

23. $3x^2 + 2x + 1 = 0$

$a=3\ b=2\ c=1$

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

$x = \frac{-2 \pm \sqrt{-8}}{6}$

no real roots

24. $4x^2 + x + 5 = 0$

$a=4\ b=1\ c=5$

$x = \frac{-1 \pm \sqrt{(1)^2-4(4)(5)}}{2(4)}$

$x = \frac{-1 \pm \sqrt{-79}}{8}$

no real roots