Name Key Class _____ Date _____

Quadratic Test

Review

Identify the vertex, axis of symmetry, minimum or maximum value, x-and y-intercepts, and domain and range of each function. Also, describe the transformations from the parent function.

1. $y = 4(x-2)^2$
V: (2, 0) min
AOS: $x = 2$

2. $f(x) = (x+1)^2 + 2$
V: (-1, 2) min
AOS: $x = -1$

3. $y = -\frac{1}{2}(x-4)^2 - 10$
V: (4, -10) max
AOS: $x = 4$

AOS $\frac{-b}{2a}$ $\frac{4}{2(1)} = 2$ $2^2 - 4(2) + 5$ $4 - 8 + 5$ $-4 + 5 = 1$

4. $f(x) = x^2 - 4x + 5$
V: (2, 1) min
AOS: $x = 2$

5. $f(x) = -2x^2 + 4x - 3$
V: (-1, -9) max
AOS: $x = -1$

6. $y = x^2 + 5x - 14$
V: $(-5/2, -81/4)$ min
AOS: $x = -5/2$

7. A ball is dropped from the top of a building. The distance in meters above the ground y of the ball after t seconds can be modeled by the equation $y = -9.8t^2 + 100$.

a. What is the y-intercept of the equation? 100

b. Describe the meaning of the y-intercept of the graph of the equation.
The height of the building

8. Marnie throws a softball straight up into the air. The ball leaves her hand when it is exactly 5 ft from the ground. The height h of the ball, in feet, can be written as a function of time t, in seconds, as $h = -16t^2 + 40t + 5$.

$\frac{-b}{2a} = \frac{-40}{2(-16)}$ $\frac{-40}{-32} = \frac{5}{4}$

a. What is the maximum height the ball reaches? 30 feet

b. Marnie catches the ball 5 ft from the ground. How long was the ball in the air? 2.50 sec

Find an equation in standard form of the parabola passing through the given points.

9. (0, 3), (1, 2), (2, 3) $y = x^2 - 2x + 3$

10. (-3, -4), (0, -4), (1, 0) $y = x^2 + 3x - 4$

11. (-1, 0), (0, 3), (1, 2) $y = -2x^2 + x + 3$

12. The table shows the relation between the speed of a car and its stopping distance.

Speed (mi/h)	35	45	50	60
Stopping Distance (ft)	96	140	165	221

a. Use a quadratic function to model the data. $y = .04x^2 + 1.2x + 5$

b. Predict the stopping distance for a car traveling at 65 mi/h.
252 ft

13. A toy rocket is fired upward from the ground. The relation between its height h, in feet, and the time t from launch, in seconds, can be described by the equation $h = -16t^2 + 64t$. How long does the rocket stay more than 48 feet above the ground?

2 seconds

window
Xmax = 1500
Ymax = 1,000,000

$\frac{-b}{2a}$

$\frac{-2500}{2(-2)}$

14. The expression $P(x) = 2500x - 2x^2$ describes the profit of a company that customizes bulldozers when it customizes x bulldozers in a month.

a. How many bulldozers per month must the company customize to make the maximum possible profit? What is the maximum profit?

625 bulldozers; $781,250

b. Describe a reasonable domain and range for the function $P(x)$.

c. For what number of bulldozers per month is the profit at least $750,000?

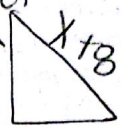
$750,000 = 2500x - 2x^2$

$Y_1 = 750,000$

$Y_2 = 2500x - 2x^2$ Find intersect

~ 500

15. The lengths of the sides of a right triangle are x, $x + 4$, and $x + 8$ inches. What is the value of x? What is the length of the hypotenuse of the triangle?



$x = 0$; $x + 8$

$0 + 8 = 8$

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

$2(\frac{1}{2}x + 2x) = (0)^2$

$x + 4x = 0$

$x(x+4) = 0$

$x = 0, -4$

Evaluate the discriminant of each equation. Tell how many real solutions each equation has.

$b^2 - 4ac$

16. $x^2 + 4x = 17$ $x^2 + 4x - 17$ $(4)^2 - 4(1)(-17)$ $16 + 68$ 84; 2 R

17. $2x^2 + x = -1$ $2x^2 + x + 1$ $(1)^2 - 4(2)(1)$ $1 - 8$ −7; 0 R

18. $x^2 - 4x + 5 = 0$ $(-4)^2 - 4(1)(5)$ $16 - 20 = -4$; 0 R

19. $2x^2 + 5x = 0$ $(5)^2 - 4(2)(0)$ $25 - 0$ 25; 2 R

20. $x^2 - 19 = 1$ $x^2 - 19 - 1$ $(-19)^2 - 4(1)(-1)$ $361 + 4 = 365$; 2 R

21. $3x^2 = 8x - 4$ $3x^2 - 8x + 4$ $(-8)^2 - 4(3)(4)$ $64 - 48 = 16$; 2 R

22. The height y of a parabolic arch is given by $y = -\frac{1}{16}x^2 + 40$, where x is the horizontal distance from the center of the base of the arch. All distances are in feet.

$\frac{-b}{2a} = \frac{0}{2(-1/16)} = 0$ $-1/16(0)^2 + 40$

a. What is the highest point on the arch?

40 ft

$-\frac{1}{16}x^2 + 40 = 0$

$(-16) - \frac{1}{16}x^2 = -40(-16)$

$x^2 = \sqrt{640}$

$x = \pm 8\sqrt{10}$

b. How wide is the arch at the base to the nearest tenth of a foot?

$16\sqrt{10}$ or ~ 25.3

23. Write the equation of a parabola with vertex (-2, 6) that passes through the point (2, -8).

$y = a(x+2)^2 + 6$

$-8 = a(2+2)^2 + 6$

$-8 = a(4)^2 + 6$

$-8 = 16a + 6$

$-6 \quad -6$

$-14 = 16a$

$\frac{-14}{16} = \frac{16a}{16}$

$a = -7/8$

$y = -7/8(x+2)^2 + 6$

$(-\frac{11}{4} \cdot \frac{1}{2})^2$

$(-\frac{11}{8})^2$

$\frac{121}{64}$

$\frac{3}{4} \cdot 16$

$\frac{169}{64}$

Solve by Completing the Square. Show all work. Circle your final answer.

24. $4x^2 - 11x - 3 = 0$

$\frac{4x^2}{4} - \frac{11x}{4} - \frac{3}{4} = 0$

$x^2 - 11/4x - 3/4 = 0$

$x^2 - 11/4x + (-\frac{11}{8})^2 = 3/4 + (-\frac{11}{8})^2$

$(x - 11/8)^2 = \frac{169}{64}$

$x - 11/8 = \pm\frac{13}{8} + \frac{11}{8}$

$\frac{13}{8} + \frac{11}{8} = \frac{24}{8} = 3$

$-\frac{13}{8} + \frac{11}{8} = -\frac{2}{8} = -1/4$

25. $x^2 + 6x + 15 = 0$

$x^2 + 6x + 9 = -15 + 9$

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

$x + 3 = \pm i\sqrt{6}$

$-3 \quad -3$

$x = -3, \pm i\sqrt{6}$

$(\frac{6}{2})^2$

3^2

$X = \frac{7 \pm \sqrt{(7)^2 - 4(3)(3)}}{2(3)}$

$= \frac{7 \pm \sqrt{49 - 36}}{6}$

$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Solve by using the Quadratic Formula. Show all work. Circle your final answer.

26. $3x^2 - 7x = -3$

$3x^2 - 7x + 3$

$= \boxed{\frac{7 \pm \sqrt{13}}{6}}$

27. $6x^2 - 3 = -7x$

$6x^2 + 7x - 3 = 0$

$X = \frac{-7 \pm \sqrt{(7)^2 - 4(6)(-3)}}{2(6)}$

$= \frac{-7 \pm \sqrt{49 + 72}}{12}$

$= \frac{-7 \pm \sqrt{121}}{6} = \frac{-7 \pm 11}{6}$

$\frac{-7+11}{6}$ $\quad \frac{-7-11}{6}$

$= \boxed{2/3 \text{ & } -3}$

Solve using Any Method. Show all work. Circle your final answer.

28. $2x^2 - 5x = 6$

$2x^2 - 5x - 6 = 0$

$\boxed{-.886 \text{ & } 3.386}$ graphed on calculator

29. $4x^2 - 6x + 3 = 0$

$\frac{6 \pm \sqrt{(6)^2 - 4(4)(3)}}{2(4)}$

$\frac{6 \pm \sqrt{36 - 48}}{8} = \frac{6 \pm \sqrt{-12}}{8} = \frac{6 \pm 2i\sqrt{3}}{8}$

$\frac{2(3 \pm i\sqrt{3})}{4 \; 8} = \boxed{\frac{3 \pm i\sqrt{3}}{4}}$

Solve using Any Method. Show all work. Circle your final answer.

30. $2x^2 - 17x - 5 = 0$

$\boxed{-.284 \text{ & } 8.784}$ graphed on calculator

31. $-2x^2 + 8x - 15 = 0$

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

$\frac{-8 \pm \sqrt{64 - 120}}{-4} = \frac{-8 \pm \sqrt{-56}}{-4} = \frac{-8 \pm 2i\sqrt{2}}{-4}$

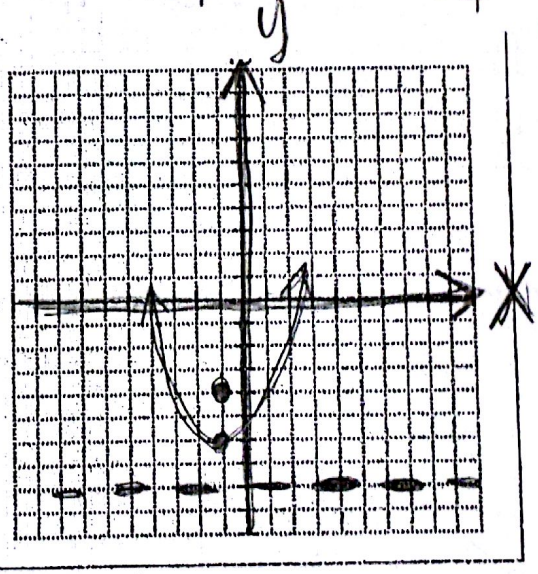
$= \frac{-2(4 \pm i\sqrt{2})}{-4 \; 2}$

$= \boxed{\frac{4 \pm i\sqrt{2}}{2}}$

32.

Given: $y = \frac{1}{8}(x+1)^2 - 6$

- Vertex $(-1, -6)$
- direction of opening: up
- axis of symmetry (eq.): $x = -1$
- directrix (eq.): $y = -8$
- focus (ord.pr.): $(-1, -4)$



$d = 1/4a$

$d = \frac{1}{4(1/8)}$

$d = \frac{1}{4/8}$

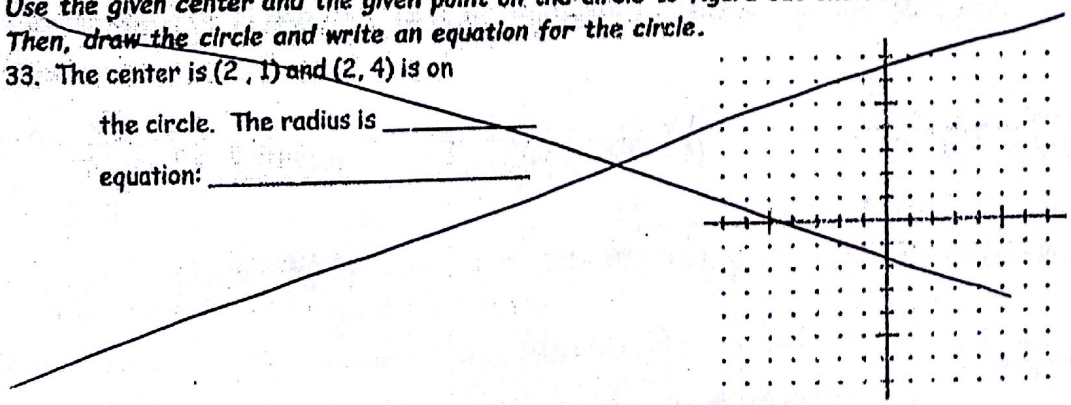
$d = \frac{1}{1/2}$

$d = 1 - \frac{2}{1} = 2$

Use the given center and the given point on the circle to figure out the radius. Then, draw the circle and write an equation for the circle.

33. The center is (2 , 1) and (2, 4) is on the circle. The radius is _____

equation: _____



$d = \frac{1}{4a}$

$2 = \frac{1}{4a}$

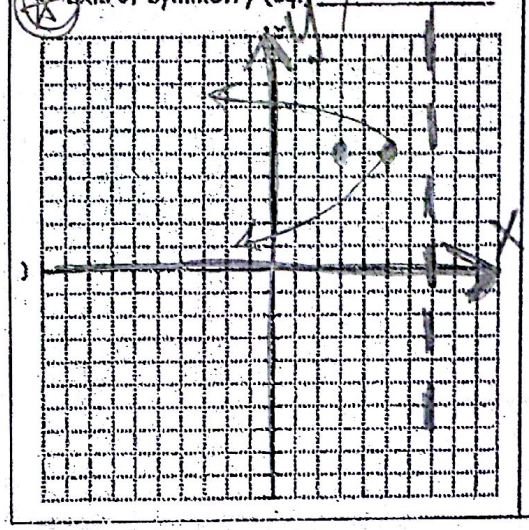
$8a = 1$

$a = 1/8$

34. focus (3, 5); directrix $x = 7$

Equation: $x = -1/8(y-5)^2 + 5$

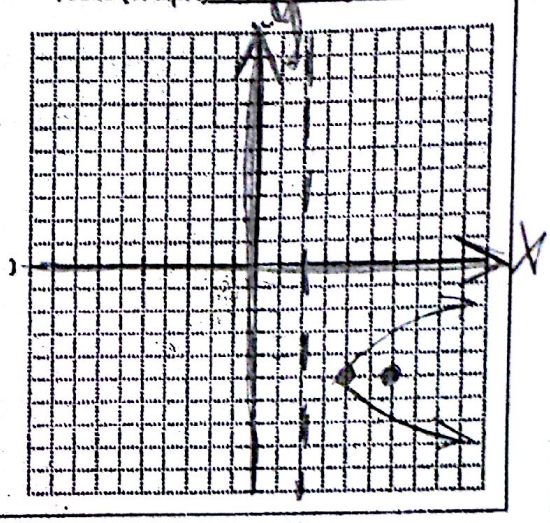
- Vertex (5, 5) a = 1/8
- direction of opening left
- axis of symmetry (eq.) $y = 5$



35. vertex (4, -5); directrix $x = 2$

Equation: $x = 1/8(y+5)^2 + 4$

- direction right a = 1/8
- axis of symmetry (eq.) $y = -5$
- focus (ord.pr.) (6, -5)



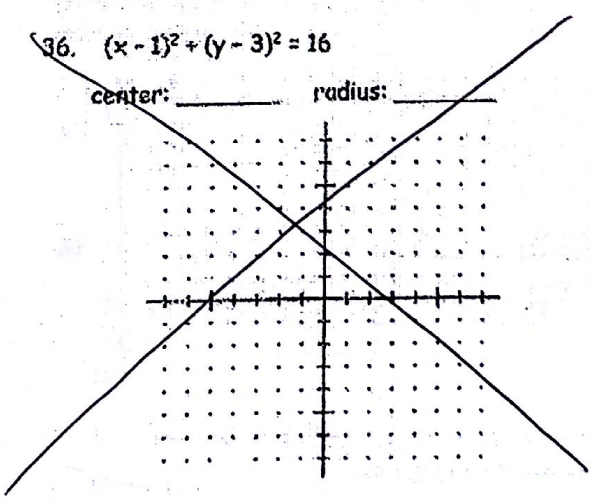
$2 = \frac{1}{4a}$

$8a = 1$

$a = 1/8$

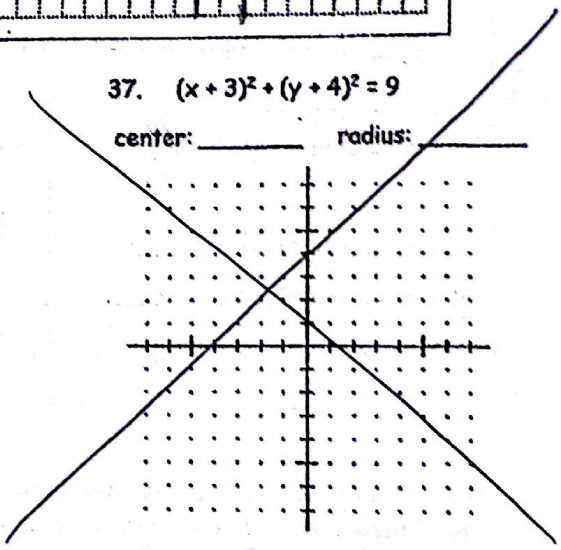
36. $(x-1)^2 + (y-3)^2 = 16$

center: _____ radius: _____



37. $(x+3)^2 + (y+4)^2 = 9$

center: _____ radius: _____



$i^2 = -1$

Simplify.

38. $\sqrt{-24}$ $\pm 2i\sqrt{6}$

3 2 2 2

39. $(4 + \sqrt{-25})(\sqrt{-100})$ $(4+5i)(10i)$

$40i + 50(-1)$

$-50 + 40i$

40. $(9 + 7i) - (6 - 2i)$ $(9+7i) + (-6+2i)$

$3 + 9i$

41. $(1 - 9i)(3 + 2i)$

42. $(3i)^2 - 3(1 + 5i)$

$9(-1) - 3 - 15i$

$-9 - 3 - 15i$

$-12 - 15i$

43. $\frac{1-5i}{1+5i}$ $(1-5i)$

$= \frac{1 - 5i - 3i + 15(-1)}{-25(-1)}$

$= \frac{-14 - 8i}{25}$

44. $\frac{4-6i}{2i}$ $(-2i)$ $(-2i)$

$= \frac{-8i + 12(-1)}{-4(-1)}$

$= \frac{-12 - 8i}{4} = \frac{4(-3-2i)}{4} = -3 - 2i$