Date: _____ Name: _____

Practice Finding Quadratic Equations

1. State the family of quadratics in ***vertex form*** if the parabola is vertically compressed (choose 3 or 1/3), shifted right 5 units, down 1 unit.

2. State the family of quadratics in ***vertex form*** given that the quadratic opens up, has an axis of symmetry of $x = -8$ and shifted down by 5 units.

3. State the equation in ***vertex form*** given that the quadratic has a MAXIMUM of y = -4, is shifted to the left by 6 units and is horizontally stretched (choose 2 or 1/2)

4. State the equation in ***factored form***, given that the parabola has zeros at -3, and 4 and a y-intercept of 2

5. State the equation in ***vertex* form** given the parabola has a vertex of (-5, -7) and that the graph goes through the point (-1, 11)

6. State the family of quadratics in ***standard form***, given that the parabola has zeros at $6 - \sqrt{12}$, and $6 + \sqrt{12}$

7. State the equation in ***standard form***, given that the parabola has zeros at $1 - \sqrt{5}$, and $1 + \sqrt{5}$ and goes through the point (4, -28)

8. State the equation in ***vertex* form** given the parabola has x-intercepts of -2 and 4 and an optimal value of 2.

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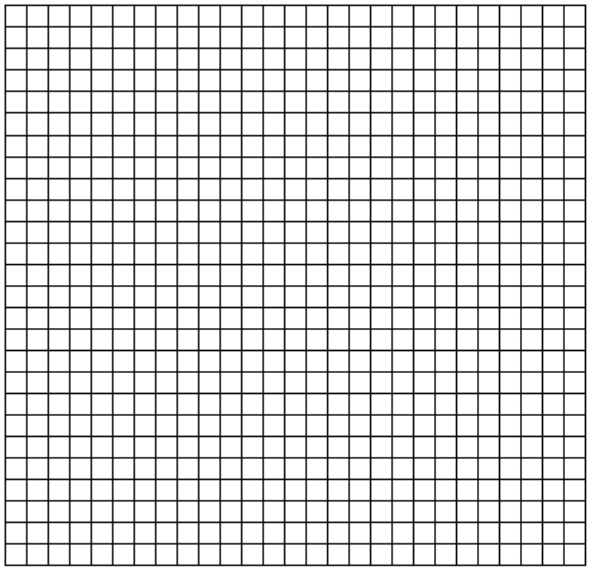
9. A ball is thrown upward from the roof of a 25 m building. The ball reaches a height of 45 m above the ground after 2 sec and hits the ground 5 sec after being thrown. Find the equation of the parabola the models this situation.

10. The Ambassador Bridge in Windsor, Ontario, has a parabola shape. The road surface spans a length of 2800 m and has a maximum height of 46 m.

a) Sketch a graph of the relation that can be used to describe the roadway, using the *y*-axis as the axis of symmetry and placing the base of the bridge at the x-axis.



b) Determine an equation for the quadratic relation that describes the road surface

A. in factored form

B. in vertex form

c) If the road surface is to pass each of two support pillars at a height of 30 m, how far from each end should the supports be placed, to the nearest metre?

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Practice Finding Quadratic Equations

ANSWERS

1. State the family of quadratics in ***vertex form*** if the parabola is vertically compressed (choose 3 or 1/3), shifted right 5 units, down 1 unit.

$y = \pm\frac{1}{3}(x-5)^2 - 1$

2. State the family of quadratics in ***vertex form*** given that the quadratic opens up, has an axis of symmetry of $x = -8$ and shifted down by 5 units.

$y = a(x+8)^2 - 5 \quad a \in \mathbb{R}, a > 0$

3. State the equation in ***vertex form*** given that the quadratic has a MAXIMUM of y = -4, is shifted to the left by 6 units and is horizontally stretched (choose 2 or ½)

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

4. State the equation in ***factored form***, given that the parabola has zeros at -3, and 4 and a y-intercept of 2

$y = a(x+3)(x-4) \qquad (0,2)$

$2 = a(0+3)(0-4)$

$2 = -12a$

$-\frac{1}{6} = a$

$\therefore y = -\frac{1}{6}(x+3)(x-4)$

5. State the equation in ***vertex* form** given the parabola has a vertex of (-5, -7) and that the graph goes through the point (-1, 11)

$y = a(x+5)^2 - 7$

$11 = a(-1+5)^2 - 7$

$11 = 16a - 7$

$18 = 16a$

$\frac{9}{8} = a \quad \therefore y = \frac{9}{8}(x+5)^2 - 7$

6. State the family of quadratics in ***standard form***, given that the parabola has zeros at $6 - \sqrt{12}$, and $6 + \sqrt{12}$

$y = a(x-(6-\sqrt{12}))(x-(6+\sqrt{12}))$

$y = a(x-6+\sqrt{12})(x-6-\sqrt{12})$

$y = a(x^2 - 6x - \sqrt{12}x - 6x + 36 + 6\sqrt{12} + \sqrt{12}x - 6\sqrt{12} - \sqrt{144})$

$y = a(x^2 - 12x + 36 - 12)$

$y = a(x^2 - 12x + 24) \quad a \in \mathbb{R}, a \neq 0$

7. State the equation in ***standard form***, given that the parabola has zeros at $1 - \sqrt{5}$, and $1 + \sqrt{5}$ and goes through the point (4, -28)

$y = a(x-(1-\sqrt{5}))(x-(1+\sqrt{5}))$

$y = a(x-1+\sqrt{5})(x-1-\sqrt{5})$

$y = a(x^2 - x - \sqrt{5}x - x + 1 + \sqrt{5} + \sqrt{5}x - \sqrt{5} - \sqrt{25})$

$y = a(x^2 - 2x - 4)$ sub pt. $(4,-28)$

$-28 = a(4^2 - 2(4) - 4)$

$-28 = 4a$

$-7 = a \quad \therefore y = -7x^2 + 14x + 28$

8. State the equation in ***vertex* form** given the parabola has x-intercepts of -2 and 4 and an optimal value of 2.

$a.o.s = \frac{-2+4}{2} = \frac{2}{2} = 1$

$\therefore$ vertex $= (1, 2)$

$y = a(x-1)^2 + 2$ sub pt $(4,0)$

$0 = a(4-1)^2 + 2$

$0 = 9a + 2$

$-\frac{2}{9} = a \quad \therefore y = -\frac{2}{9}(x-1)^2 + 2$

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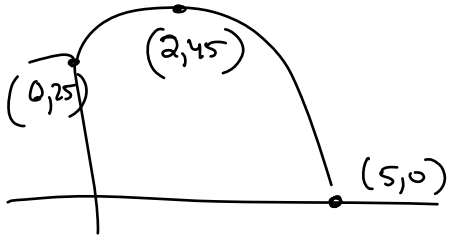
9. A ball is thrown upward from the roof of a 25 m building. The ball reaches a height of 45 m above the ground after 2 sec and hits the ground 5 sec after being thrown. Find the equation of the parabola the models this situation.



any form.

$y = a(x-h)^2 + k$

$y = a(x-2)^2 + 45$ pt. (0,25)

$25 = a(0-2)^2 + 45$

$25 = 4a + 45$

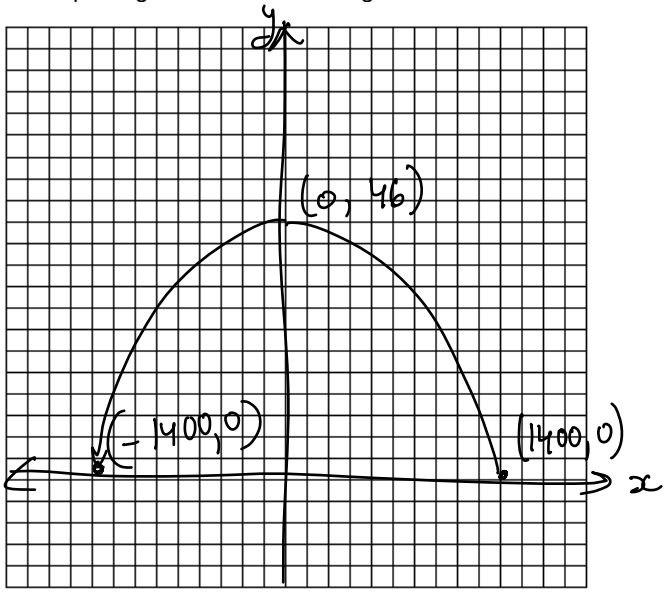
$-20 = 4a$

$-5 = a$

$\therefore y = -5(x-2)^2 + 45$

10. The Ambassador Bridge in Windsor, Ontario, has a parabola shape. The road surface spans a length of 2800 m and has a maximum height of 46 m.

a) Sketch a graph of the relation that can be used to describe the roadway, using the *y*-axis as the axis of symmetry and placing the base of the bridge at the x-axis.



b) Determine an equation for the quadratic relation that describes the road surface

A. in factored form

$y = a(x-1400)(x+1400)$ pt. (0,46)

$46 = a(0-1400)(0+1400)$

$46 = -1960000a$

$-\frac{23}{980000} = a$

$\therefore y = \frac{23}{980000}(x-1400)(x+1400)$

B. in vertex form

$y = \frac{-23}{980000}(x-0)^2 + 46$

$y = -\frac{23}{980000}x^2 + 46$

c) If the road surface is to pass each of two support pillars at a height of 30 m, how far from each end should the supports be placed, to the nearest metre?

sub $y = 30$

$30 = \frac{-23}{980000}x^2 + 46$ can isolate since x appears ONCE

$-16 = \frac{-23}{980000}x^2$

$\frac{15680000}{23} = x^2$

$x \doteq 826$ or $x \doteq -826$ from origin

1400 − 826

$\therefore$ about 574 m from each end

place the support at height 30m.