atic Equations: Review
r Section

PLE CHOICE

1. ANS: A PTS: 1 DIF: Average OBJ: Section 4.1
   NAT: RF 5 TOP: Graphical Solutions of Quadratic Equations
   KEY: two real roots
2. ANS: D PTS: 1 DIF: Easy OBJ: Section 4.2
   NAT: RF 5 TOP: Factoring Quadratic Equations KEY: factor trinomial
3. ANS: A PTS: 1 DIF: Average OBJ: Section 4.2
   NAT: RF 5 TOP: Factoring Quadratic Equations KEY: factor trinomial
4. ANS: C PTS: 1 DIF: Difficult OBJ: Section 4.2
   NAT: RF 5 TOP: Factoring Quadratic Equations KEY: solve trinomial
5. ANS: C PTS: 1 DIF: Easy OBJ: Section 4.2
   NAT: RF 5 TOP: Factoring Quadratic Equations KEY: solve factored trinomial
6. ANS: A PTS: 1 DIF: Easy OBJ: Section 4.3
   NAT: RF 5 TOP: Solving Quadratic Equations by Completing the Square
   KEY: perfect square trinomial
7. ANS: C PTS: 1 DIF: Average OBJ: Section 4.3
   NAT: RF 5 TOP: Solving Quadratic Equations by Completing the Square
   KEY: vertext form
8. ANS: D PTS: 1 DIF: Difficult OBJ: Section 4.4
   NAT: RF 5 TOP: The Quadratic Formula KEY: quadratic formula
9. ANS: C PTS: 1 DIF: Average OBJ: Section 4.4
   NAT: RF 5 TOP: The Quadratic Formula KEY: quadratic formula | extraneous root
10. ANS: D PTS: 1 DIF: Average OBJ: Section 4.4
    NAT: RF 5 TOP: The Quadratic Formula
    KEY: quadratic formula | parabolic motion
11. ANS: B PTS: 1 DIF: Difficult OBJ: Section 4.4
    NAT: RF 5 TOP: The Quadratic Formula KEY: x-intercepts

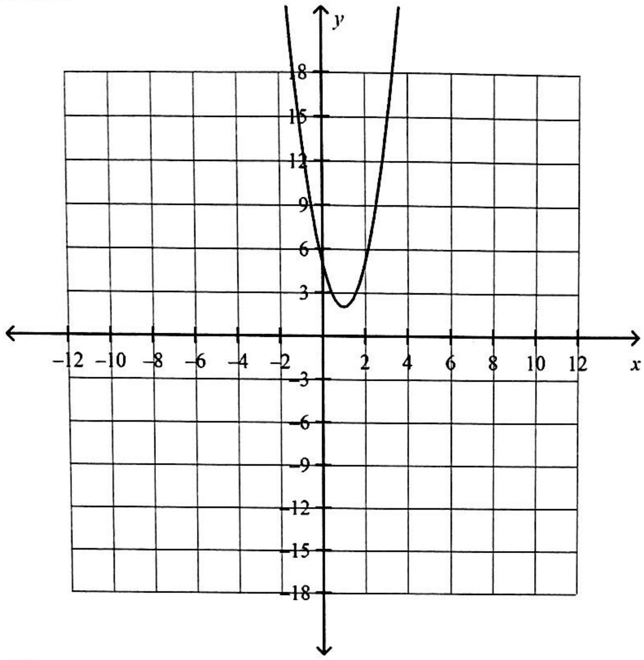
PLETION

1. ANS: $y = -0.75x^2 - 2.25x - 1.5$

   PTS: 1 DIF: Average OBJ: Section 4.1 NAT: RF 5
   TOP: Graphical Solutions of Quadratic Equations KEY: roots of quadratic equation

SHORT ANSWER

1. ANS:



There are no zeros.

PTS: 1 DIF: Average OBJ: Section 4.1 NAT: RF 5
TOP: Graphical Solutions of Quadratic Equations KEY: zeros | x-intercepts

2. ANS:
a) $k = 20.25$
b) $k < 20.25$
c) $k > 20.25$

PTS: 1 DIF: Difficult OBJ: Section 4.4 NAT: RF 5
TOP: The Quadratic Formula KEY: number of roots

3. ANS:
Rearrange the equation so all terms are on the same side:

$3x^2 - 8x + 4 = 0$

Calculate the discriminant $b^2 - 4ac$:

$$\begin{aligned}(-8)^2 - 4(3)(4) &= 64 - 48 \\ &= 16\end{aligned}$$

Since the discriminant is positive (greater than zero), the equation has 2 real roots.

a) $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{8 \pm \sqrt{16}}{2(3)}$

$= \dfrac{8 \pm 4}{6}$

$= 2$ and $\dfrac{2}{3}$

b) $3x^2 - 8x + 4 = 0$

$(3x - 2)(x - 2) = 0$

$3x - 2 = 0 \qquad x - 2 = 0$

$3x = 2 \qquad x = 2$

$x = \dfrac{2}{3}$

PTS: 1 DIF: Average OBJ: Section 4.3 | Section 4.4
NAT: RF 5 TOP: Factoring Quadratic Equations | The Quadratic Formula
KEY: roots of quadratic equation | solve factored trinomial

4. ANS:

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

$$= \frac{10 \pm \sqrt{(-10)^2 - 4(3)(6)}}{2(3)}$$

$$= \frac{10 \pm \sqrt{100 - 72}}{6}$$

$$= \frac{10 \pm \sqrt{28}}{6}$$

$$= \frac{10 \pm 2\sqrt{7}}{6}$$

$$= \frac{5 \pm \sqrt{7}}{3}$$

$$= \frac{5 + \sqrt{7}}{3} \text{ and } \frac{5 - \sqrt{7}}{3}$$

PTS: 1 DIF: Average OBJ: Section 4.4 NAT: RF 5
TOP: The Quadratic Formula KEY: roots of quadratic equation | quadratic formula

5. ANS:

The x-intercepts are –2 and 3. These correspond to factors of $(x + 2)$ and $(x - 3)$. The equation is of the form $y = a(x + 2)(x - 3)$.
Expand and simplify the right side of the equation:

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

Substitute the known point on the curve $(0.5, -6.25)$ to determine the value of a:

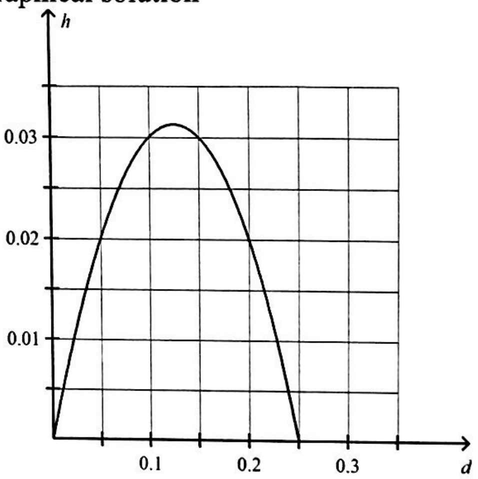
$$y = a(x^2 - x - 6)$$
$$-6.25 = a[(0.5)^2 - 0.5 - 6]$$
$$-6.25 = a(0.25 - 6.5)$$
$$-6.25 = a(-6.25)$$
$$a = 1$$

The value of a is 1, so the equation is $y = x^2 - x - 6$.

PTS: 1 DIF: Easy OBJ: Section 4.1 NAT: RF 5
TOP: Graphical Solutions of Quadratic Equations KEY: quadratic function | parabola

PROBLEM

1. ANS:
Graphical solution



Determine the zeros of the function (or roots of the equation) by setting $h = 0$ and then factoring the equation:

$0 = -2d^2 + 0.5d$

$0 = d(-2d + 0.5)$

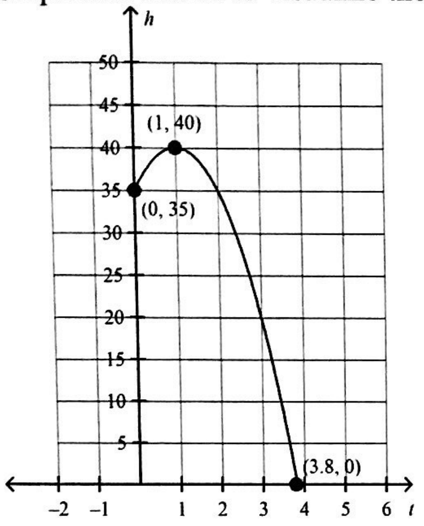
$d = 0$ or $-2d + 0.5 = 0$

$d = 0$ or $d = 0.25$

The ball travels 0.25 m or 25 cm horizontally.

PTS: 1 DIF: Difficult OBJ: Section 4.1 | Section 4.2
NAT: RF 5 TOP: Graphical Solutions of Quadratic Equations | Factoring Quadratic Equations

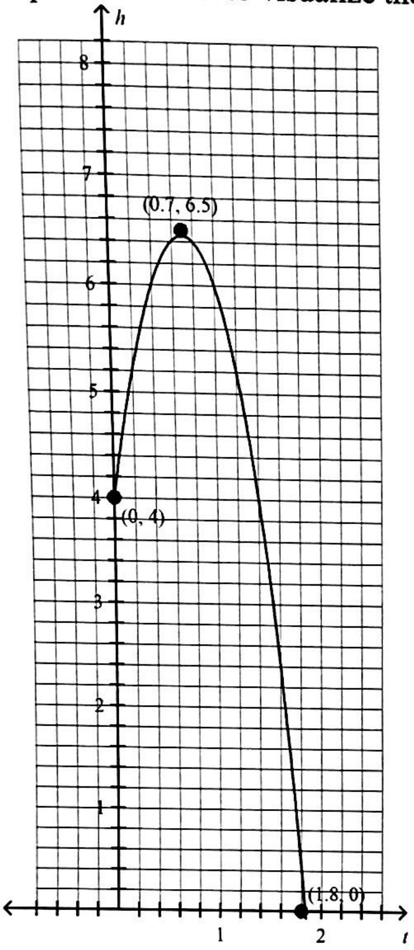
2. ANS:
Graph the relation to visualize the situation.



From the graph:
a) The maximum height of the ball is 40 m.
b) It takes 1 s to reach the maximum height.
c) The *t*-intercept is approximately 3.8. The ball hits the ground after about 3.8 s.
From the equation:
d) When $t = 0$, $h = 35$. The bridge is 35 m above the river.

PTS: 1 DIF: Average OBJ: Section 4.1 NAT: RF 5
TOP: Graphical Solutions of Quadratic Equations
KEY: maximum | x-intercepts | parabolic motion

3. ANS:
Graph the relation to visualize the situation.



From the graph:
a) The maximum height is about 6.5 m.
b) It takes about 0.7 s to reach the maximum height.
c) The t-intercept is about 1.8. It takes Nina about 1.8 s to enter the water.
d) Substituting $t = 0$ into the equation, or reading from the graph at $t = 0$, $h = 4$. So, the board is 4 m above the water.

PTS: 1 DIF: Difficult OBJ: Section 4.1 NAT: RF 5
TOP: Graphical Solutions of Quadratic Equations
KEY: maximum | x-intercepts | parabolic motion

4. ANS:
Let x represent the first number and $x + 3$ represent the second.
Then,

$$x^2 + (x+3)^2 = 89$$

$$x^2 + x^2 + 6x + 9 = 89$$

$$2x^2 + 6x - 80 = 0$$

$$x^2 + 3x - 40 = 0$$

$$(x+8)(x-5) = 0$$

$$x = 5 \text{ or } x = -8$$

Since the result is a whole number, the negative value is rejected and the numbers are 5 and 8.

PTS: 1 DIF: Easy OBJ: Section 4.2 NAT: RF 5
TOP: Factoring Quadratic Equations KEY: factor quadratic

5. ANS:
Use the Pythagorean theorem.

$$(x+4)^2 + x^2 = 20^2$$

$$x^2 + 8x + 16 + x^2 = 400$$

$$2x^2 + 8x - 384 = 0$$

Factor the trinomial to find the zeros of the quadratic relation.

$$2x^2 + 8x - 384 = 0$$

$$x^2 + 4x - 192 = 0$$

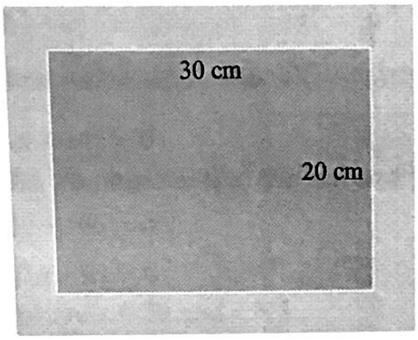
$$(x+16)(x-12) = 0$$

$$x = -16 \text{ or } x = 12$$

The zeros are −16 and 12.
Since a negative distance is not reasonable, the value for x is 12.
The dimensions of the rectangle are 12 cm by 16 cm.

PTS: 1 DIF: Difficult OBJ: Section 4.2 NAT: RF 5
TOP: Factoring Quadratic Equations KEY: roots of quadratic equation

6. ANS:
Sketch a diagram to visualize the situation.



The area of the photo is 30 cm × 20 cm = 600 cm². The area of the border is four times this or 2400 cm².
Therefore, the area of the photo and border is 3000 cm².
Let x be the width of the border, in centimetres.
The outside dimensions of the border are $(30 + 2x)$ by $(20 + 2x)$.

$$(30+2x)(20+2x) = 3000$$
$$600 + 60x + 40x + 4x^2 = 3000$$
$$4x^2 + 100x - 2400 = 0$$
$$4(x^2 + 25x - 600) = 0$$
$$(x+40)(x-15) = 0$$
$$x = -40 \text{ or } x = 15$$

The zeros are at $x = -40$ and $x = 15$. Discard the negative zero.
The width of the border is 15 cm.
The outside dimensions of the border are 60 cm by 50 cm.

PTS: 1 DIF: Average OBJ: Section 4.2 NAT: RF 5
TOP: Factoring Quadratic Equations KEY: roots of quadratic equation

Let x centimetres be the length of edging cut off.
The measures of the cut pieces of edging are $20 - x$, $41 - x$, and $44 - x$.
Since they form a right triangle, use the Pythagorean theorem.

$$(44 - x)^2 = (20 - x)^2 + (41 - x)^2$$

$$1936 - 88x + x^2 = (400 - 40x + x^2) + (1681 - 82x + x^2)$$

$$x^2 - 34x + 145 = 0$$

Factor the trinomial to find the zeros of the quadratic relation.

$$x^2 - 34x + 145 = 0$$

$$(x - 29)(x - 5) = 0$$

The zeros are $x = 29$ and $x = 5$.
Since the shortest piece of edging is less than 29 cm long, the amount to be cut off must be 5 cm.
The new rods are 15 cm, 36 cm, and 39 cm long.

PTS: 1 DIF: Average OBJ: Section 4.2 NAT: RF 5
TOP: Factoring Quadratic Equations KEY: factor trinomial

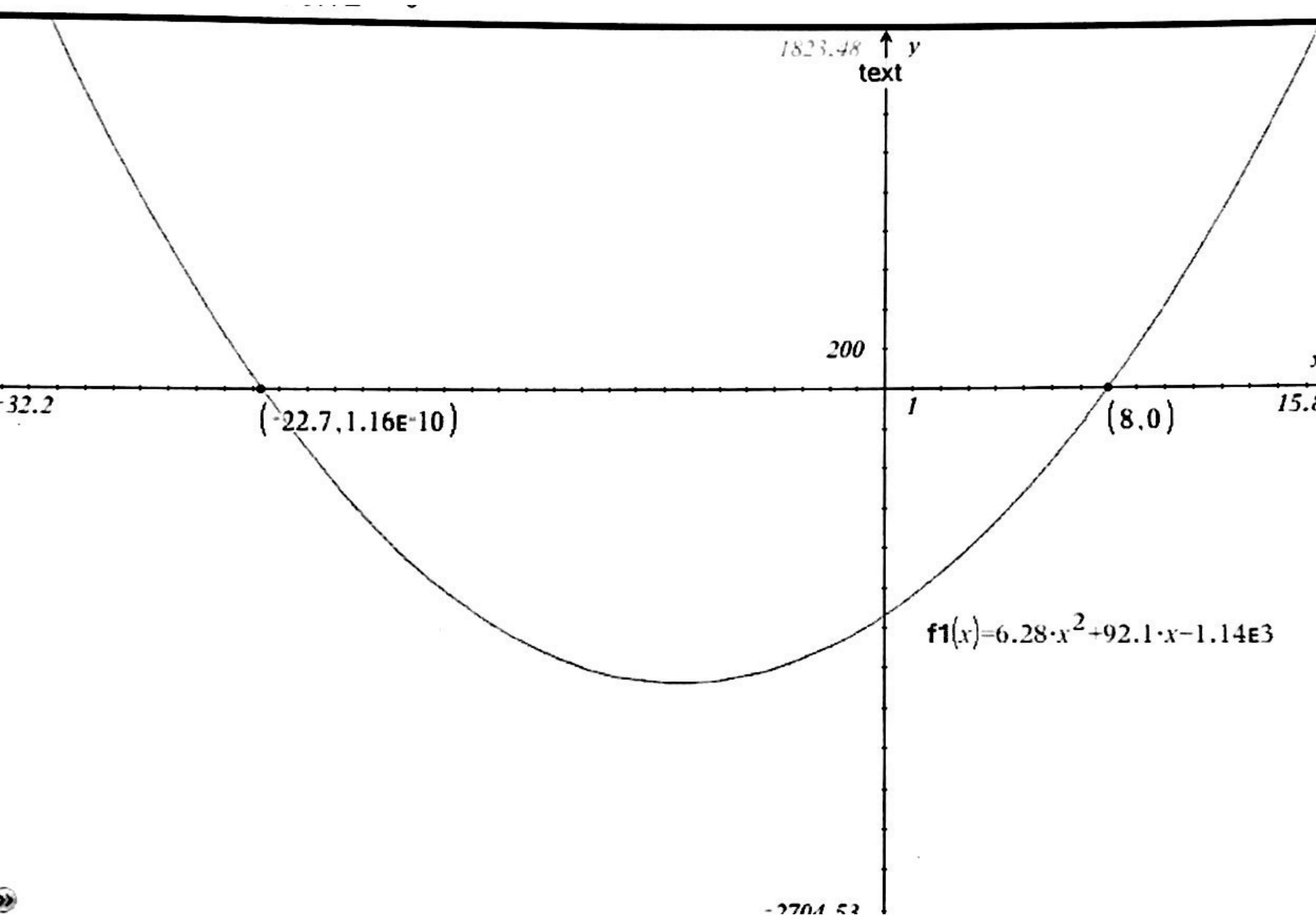
8. ANS:
Set $h = 0$ and solve for d.

$$d = \frac{-24 \pm \sqrt{(24)^2 - 4(-5)(30)}}{2(-5)}$$

$$= \frac{-24 \pm \sqrt{576 + 600}}{-10}$$

$$= \frac{-24 \pm \sqrt{1176}}{-10}$$

$d = -1.03$ or $d = 5.83$


1823.48
y
text
200
-32.2
(-22.7,1.16E-10)
1
(8,0)
15.8
f1(x)=6.28·x^2+92.1·x−1.14E3
-2704.53