Quiz 2 will cover the following topics: all topics from Quiz 1; radical expressions (handout), the straight line and slope (1.3, handout); and graphing a parabola (handout)

## Review Problems

1. Simplify each of the following expressions.

   a) $\sqrt{125} - 3\sqrt{80} + \sqrt{45}$ b) $\left(\sqrt{7} - 2\right)^2$ c) $\left(\sqrt{3} - 1\right)^3$

2. Rationalize the denominator in each of the following expressions.

   a) $\dfrac{3}{\sqrt{5}}$ b) $\dfrac{1}{\sqrt{10} - 3}$ c) $\dfrac{2}{\sqrt{7} + 1}$

3. Compute the exact value of $x^2 - 4x + 6$ if $x = 2 - \sqrt{3}$.

4. Graph the following equations in the same coordinate system.

$$y = -\frac{1}{2}x + 1 \quad \text{and} \quad y = -\left(-\frac{1}{2}x + 1\right)$$

5. Graph the following equations in the same coordinate system.

$$y = 2x - 3 \quad \text{and} \quad y = |2x - 3|$$

6. Find an equation of the straight line that passes through the points $(3, -1)$ and $(1, 5)$.

7. Graph the parabola $y = -8x + x^2 + 15$. Clearly label the coordinates of five points on the parabola, including vertex and intercepts.

8. One side of a rectangle is 4 in shorter than 3 times the other side. Find the sides of the rectangle if its perimeter is 48 in.

9. One side of a rectangle is 18 in shorter than the other side. Find the sides of the rectangle if its area is 360 $\text{in}^2$.

10. We threw a tennis ball upwards, standing on a roof top 200 meters high, with an initial upward velocity of 30 $\frac{\text{m}}{\text{s}}$. The ball travels upward and then falls to the ground. The height of the ball, measured in meter (counting ground level as zero) is $h(t) = -5t^2 + 30t + 200$. Time is measured in seconds.

    (a) Complete the following table.

| $t$ | 0 | 1 | 2 | 3 | 4 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| $h(t)$ | | | | | | | |

    (b) How long does it take for the ball to hit the ground?

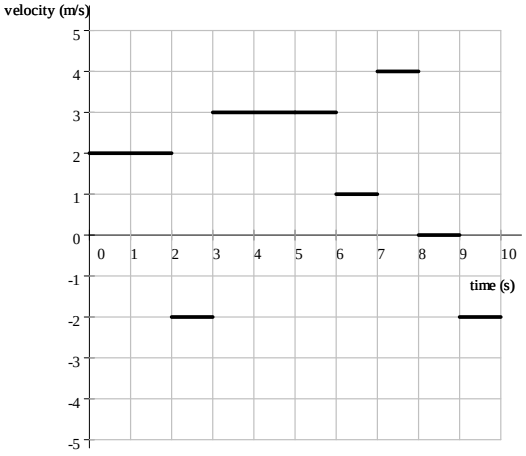
    (c) Find the average velocity between

    i) $t = 0$ and $t = 2$ seconds

    ii) $t = 3$ seconds and $t = 5$ seconds

    iii) $t = 4$ seconds and $t = 9$ seconds

11. The picture below shows the velocity function, $v(t)$ of an object. (Time is measured in seconds, distance in meters, velocity in $\frac{\text{m}}{\text{s}}$. Positive direction is upward.).




How far is the object from the starting point at

a) $t = 1\,\text{s}$ b) $t = 3\,\text{s}$ c) $t = 5\,\text{s}$ d) $t = 10\,\text{s}$?

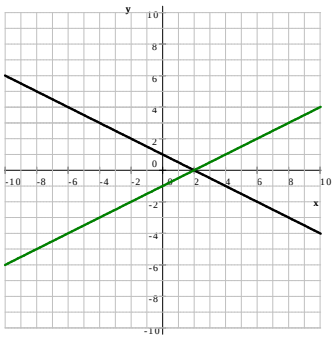
# Review Problems - Answers

1. For more practice and detailed solutions, see handout Radical Expressions.
   a) $-4\sqrt{5}$ b) $11-4\sqrt{7}$ c) $-10+6\sqrt{3}$

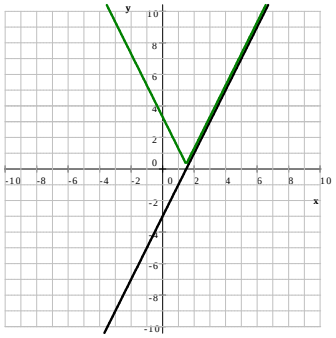
2. For more practice and detailed solutions, see handout Radical Expressions.
   a) $\dfrac{3\sqrt{5}}{5}$ b) $\sqrt{10}+3$ c) $\dfrac{\sqrt{7}-1}{3}$

3. For more practice and detailed solutions, see handout Radical Expressions. 5

4. $y=-\dfrac{1}{2}x+1$ is the black graph and $y=-\left(-\dfrac{1}{2}x+1\right)$ is the green graph.

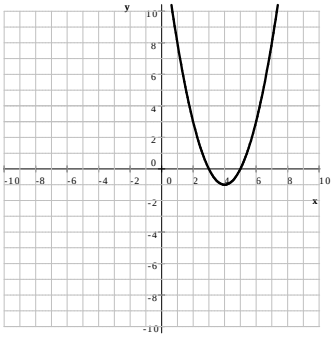


5. $y=2x-3$ is the black graph and $y=|2x-3|$ is the green graph.



6. For more practice and detailed solutions, see the textbook, Section 1.3 and handout: Writing Equations of Lines. $y=-3x+8$

7. For more practice and detailed solutions, see handout Graphing a Parabola.
$y-$intecept: $(0, 15)$; vertex: $(4, -1)$; $x-$intercepts: $(3, 0)$ and $(5, 0)$. Additional points: $(2, 3)$; $(6, 3)$



8. For more practice and detailed solutions, see handout Word Problems 2. 7 in and 17 in

9. For more practice and detailed solutions, see handout Word Problems 2. 12 in and 30 in

10. For more practice and detailed solutions, see handout Factoring 1.
a) b) 10 seconds c) i) $20\frac{\text{m}}{\text{s}}$ ii) $-10\frac{\text{m}}{\text{s}}$ iii) $-35\frac{\text{m}}{\text{s}}$

| $t$ | 0 s | 1 s | 2 s | 3 s | 4 s | 6 s | 9 s |
|---|---|---|---|---|---|---|---|
| $h(t)$ | 200 m | 225 m | 240 m | 245 m | 240 m | 200 m | 65 m |

Solution:
a) In each case we simply substitute into the formula. For instance, we compute $h(2)$.

$$\begin{aligned} h(t) &= -5t^2 + 30t + 200 \\ h(2) &= -5 \cdot 2^2 + 30 \cdot 2 + 200 = -5 \cdot 4 + 30 \cdot 2 + 200 = -20 + 60 + 200 = 240 \end{aligned}$$

b) see Factoring 1
c) i)

$$v_{\text{av}} = \frac{\text{distance traveled}}{\text{time}} = \frac{h(2\,\text{s}) - h(0\,\text{s})}{2\,\text{s} - 0\,\text{s}} = \frac{240\,\text{m} - 200\,\text{m}}{2\,\text{s}} = 20\frac{\text{m}}{\text{s}}$$

ii)

$$\begin{aligned} v_{\text{av}} &= \frac{\text{distance traveled}}{\text{time}} = \frac{h(5\,\text{s}) - h(3\,\text{s})}{5\,\text{s} - 3\,\text{s}} \\ &= \frac{(-5 \cdot 5^2 + 30 \cdot 5 + 200)\ \text{m} - (-5 \cdot 3^2 + 30 \cdot 3 + 200)\ \text{m}}{2\,\text{s}} = \frac{225\,\text{m} - 245\,\text{m}}{2\,\text{s}} = -10\frac{\text{m}}{\text{s}} \end{aligned}$$

The negative sign indicates that the object has traveled downward.
iii)

$$v_{\text{av}} = \frac{\text{distance traveled}}{\text{time}} = \frac{h(9\,\text{s}) - h(4\,\text{s})}{9\,\text{s} - 4\,\text{s}} = \frac{65\,\text{m} - 240\,\text{m}}{5\,\text{s}} = \frac{-175\,\text{m}}{5\,\text{s}} = -35\frac{\text{m}}{\text{s}}$$

The negative sign indicates that the object has traveled downward.

11. a) 2 m b) 2 m c) 8 m d) 14 m
Solution:
a) In the first second, the object had a constant velocity of $2\frac{\text{m}}{\text{s}}$. For one second of traveling, this means a distance of

$$\begin{aligned} s &= vt \\ s &= 2\frac{\text{m}}{\text{s}} \cdot 1\,\text{s} = 2\,\text{m} \end{aligned}$$

b) For the first two seconds, the velocity is $2\frac{\text{m}}{\text{s}}$. Then, for one second, it is $-2\frac{\text{m}}{\text{s}}$. The distance traveled is

$$\begin{aligned} s &= vt \\ s &= 2\frac{\text{m}}{\text{s}} \cdot 2\,\text{s} + \left(-2\frac{\text{m}}{\text{s}}\right) \cdot 1\,\text{s} = 4\,\text{m} - 2\,\text{m} = 2\,\text{m} \end{aligned}$$

c) For the first two seconds, the velocity is $2\frac{\text{m}}{\text{s}}$. Then, for one second, it is $-2\frac{\text{m}}{\text{s}}$. Then, for two seconds it is $2\frac{\text{m}}{\text{s}}$. The distance traveled is

$$\begin{aligned} s &= vt \\ s &= 2\frac{\text{m}}{\text{s}} \cdot 2\,\text{s} + \left(-2\frac{\text{m}}{\text{s}}\right) \cdot 1\,\text{s} + 3\frac{\text{m}}{\text{s}} \cdot 2\,\text{s} = 4\,\text{m} - 2\,\text{m} + 6\,\text{m} = 8\,\text{m} \end{aligned}$$

d)

$$\begin{aligned} s &= vt \\ s &= 2\frac{\text{m}}{\text{s}} \cdot 2\,\text{s} + \left(-2\frac{\text{m}}{\text{s}}\right) \cdot 1\,\text{s} + 3\frac{\text{m}}{\text{s}} \cdot 3\,\text{s} + 1\frac{\text{m}}{\text{s}} \cdot 1\,\text{s} + 4\frac{\text{m}}{\text{s}} \cdot 1\,\text{s} + 0\frac{\text{m}}{\text{s}} \cdot 1\,\text{s} + \left(-2\frac{\text{m}}{\text{s}}\right) \cdot 1\,\text{s} \\ &= 4\,\text{m} - 2\,\text{m} + 9\,\text{m} + 1\,\text{m} + 4\,\text{m} - 2\,\text{m} = 14\,\text{m} \end{aligned}$$