

Unit 3 Study Guide  
Solutions

<p>1a. <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math>  <math>x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(2)}}{2(1)} = \frac{5 \pm \sqrt{25-8}}{2}</math>  <math>x = \frac{5 \pm \sqrt{17}}{2} = \boxed{\frac{5 \pm \sqrt{17}}{2}}</math></p>	<p>1b. <math>g(x) = 3x^2 - x + 4</math>  <math>3x^2 - 4x + 3x + 4</math>  <math>x(3x-4) + 1(3x+4)</math>  <math>(x+1)(3x+4)</math>  <math>g(x) = 3(x+1)(x+\frac{4}{3})</math>                  roots: <math>x = -1</math> <math>x = -\frac{4}{3}</math></p>	<p>1c. <math>h(x) = 2x^2 + 5x - 7</math>  <math>2x^2 - 2x + 7x - 7</math>  <math>2x(x-1) + 7(x-1)</math>  <math>(2x+7)(x-1)</math>  <math>h(x) = 2(x+\frac{7}{2})(x-1)</math>                  roots: <math>x = -\frac{7}{2}</math> <math>x = 1</math></p>
<p>2a. <math>j(x) = 2(x+1)(x-3)</math>  <math>\downarrow \quad \downarrow</math>  <math>x = -1</math> or <math>x = 3</math></p>	<p>2b. <math>k(x) = -3(x-2)(x+4)</math>  <math>\downarrow \quad \downarrow</math>  <math>x = 2</math> or <math>x = -4</math></p>	<p>2c. <math>m(x) = -10(x)(x-6)</math>  <math>-10(x+0)(x-6)</math>  <math>\downarrow \quad \downarrow</math>  <math>x = 0</math> or <math>x = 6</math></p>
<p>3a. <math>0 = (x+3)^2 - 4</math>  <math>4 = (x+3)^2</math>  <math>\pm\sqrt{4} = x+3</math> <math>x = -3+2</math>  <math>\pm 2 = x+3</math> <math>x = -3-2</math>  <math>-3 \pm 2 = x</math> <math>x = -5</math></p>	<p>3b. <math>0 = 2(x-4)^2 + 8</math>  <math>-8 = 2(x-4)^2</math>  <math>-4 = (x-4)^2</math>  <math>\pm\sqrt{-4} = x-4</math> <math>x = 4+2i</math>  <math>\pm 2i = x-4</math> <math>x = 4-2i</math>  <math>4 \pm 2i = x</math></p>	<p>3c. <math>0 = -3(x+1)^2 + 3</math>  <math>-3 = -3(x+1)^2</math>  <math>1 = (x+1)^2</math>  <math>\pm\sqrt{1} = x+1</math> <math>x = -1+1</math>  <math>\pm 1 = x+1</math> <math>x = 0</math>  <math>-1 \pm 1 = x</math> <math>x = -1-1</math>  <math>x = -2</math></p>
<p>4a. <math>x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(-1)(1)}}{2(-1)}</math>  <math>x = \frac{2 \pm \sqrt{4+4}}{-2} = \frac{2 \pm \sqrt{8}}{-2} = \frac{2 \pm 2\sqrt{2}}{-2}</math>  <math>x = \frac{2 \pm 2\sqrt{2}}{-2} = \frac{2}{-2} \pm \frac{2\sqrt{2}}{-2} = \boxed{-1 \pm \sqrt{2}}</math></p>	<p>4b. <math>x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(10)}}{2(1)}</math>  <math>x = \frac{6 \pm \sqrt{36-40}}{2} = \frac{6 \pm \sqrt{-4}}{2} = \frac{6 \pm 2i}{2}</math>  <math>x = \frac{6 \pm 2i}{2} = \boxed{3 \pm i}</math></p>	<p>4c. <math>x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(1)}}{2(1)}</math>  <math>x = \frac{8 \pm \sqrt{64-4}}{2} = \frac{8 \pm \sqrt{60}}{2} = \frac{8 \pm 2\sqrt{15}}{2}</math>  <math>x = \frac{8 \pm 2\sqrt{15}}{2} = \frac{8}{2} \pm \frac{2\sqrt{15}}{2} = \boxed{4 \pm \sqrt{15}}</math></p>
<p>5a. <b>YES</b>                  B. <math>2(x+3)^2 + 4</math> vertex: (3, 4)                  D. <math>5(x+3)^2 + 4</math> vertex: (-3, 4)                  F. <math>5(x+3)(x-4)</math> vertex: (-3, 4)                  h: <math>\frac{-3+4}{2} = \frac{1}{2}</math> NOT</p> <p><b>NO</b>                  A. <math>-3(x-3)^2 + 4</math> vertex: (3, 4)                  C. <math>(x-3)(x+4)</math> vertex: <math>\frac{3+4}{2} = \frac{7}{2}</math> NOT                  E. <math>3(x+0)(x+4)</math> vertex: <math>\frac{0+4}{2} = 2</math> NOT</p>	<p>5b. <b>YES</b>                  B. <math>-2(x+1)^2 + 5</math> vertex: (-1, 5)                  C. <math>-5x(x+2)</math> vertex: <math>\frac{0+2}{2} = 1</math>                  K. <math>-5(-1)(-1+2) = -5(-1)(1) = 5</math> vertex: (-1, 5)                  D. <math>7(x+1)^2 + 5</math> vertex: (-1, 5)</p> <p><b>NO</b>                  A. <math>2(x-1)^2 + 5</math> vertex: (1, 5)                  E. <math>-(x-1)(x+5)</math> vertex: <math>\frac{1+5}{2} = 3</math> NOT                  F. <math>3(x+1)(x-5)</math> vertex: <math>\frac{-1+5}{2} = 2</math> NOT                  G. <math>7(x+1)^2 + 5</math> vertex: (-1, 5)</p>	<p>5c. <b>YES</b>                  A. <math>(x-2)^2 - 4</math> vertex: (2, -4)                  F. <math>x(x-4)</math> vertex: <math>\frac{0+4}{2} = 2</math>                  K. <math>(2)(2-4) = 2(-2) = -4</math>                  V. <math>(2-4)</math> vertex: (2, -4)                  E. <math>-3(x-2)^2 + 4</math> vertex: (2, 4) NOT</p> <p><b>NO</b>                  B. <math>(x+1)^2 - 4</math> vertex: (-1, -4) NOT                  C. <math>2x(x-4)</math> vertex: <math>\frac{0+4}{2} = 2</math>                  h: <math>\frac{0+4}{2} = 2</math>  <math>k = 2(2)(2-4) = 2(-4) = -8</math>                  D. <math>5(x-2)(x+4)</math> vertex: <math>\frac{2+4}{2} = 3</math> NOT                  h: <math>\frac{2+4}{2} = 3</math></p>
<p>6a. <math>h = \frac{-b}{2a} = \frac{-(-20)}{2(2)} = \frac{20}{4} = 5</math>  <math>k = 2(5)^2 - 20(5) - 3</math>  <math>k = 2(25) - 100 - 3</math>  <math>k = 50 - 100 - 3</math>  <math>k = -53</math> <math>\boxed{(5, -53)}</math></p>	<p>6b. <math>h = \frac{-b}{2a} = \frac{-16}{2(4)} = \frac{-16}{8} = -2</math>  <math>k = 4(-2)^2 + 16(-2) + 19</math>  <math>k = 4(4) - 32 + 19</math>  <math>k = 16 - 32 + 19</math>  <math>k = 3</math> <math>\boxed{(-2, 3)}</math></p>	<p>6c. <math>h = \frac{-(-8)}{2(-1)} = \frac{8}{-2} = -4</math>  <math>k = -(-4)^2 - 8(-4) - 22</math>  <math>k = -(16) + 32 - 22</math>  <math>k = -16 + 32 - 22</math>  <math>k = -6</math> <math>\boxed{(-4, -6)}</math></p>
<p>7a. <math>v(x) = -x^2 + 9x + 22</math>  <math>-x^2 - 2x + 11x + 22</math>  <math>-x(x+2) + 11(x+2)</math>  <math>(x+2)(-x+11)</math>  <math>v(x) = -(x+2)(x-11)</math></p>	<p>7b. <math>f(x) = 3x^2 - 4</math>                  Difference of squares: <math>(6x+2)(6x-2)</math>  <math>f(x) = 6(x+\frac{2}{6})(6x-2)</math>  <math>f(x) = 6(x+\frac{1}{3})(6x-2)</math>  <math>f(x) = 6 \cdot 6(x+\frac{1}{3})(6x-\frac{2}{6})</math>  <math>f(x) = 36(x+\frac{1}{3})(x-\frac{1}{3})</math></p>	<p>7c. <math>v(x) = 3x^2 - 33x + 84</math>  <math>3x^2 - 21x - 12x + 84</math>  <math>3x(x-7) - 12(x-7)</math>  <math>(3x-12)(x-7)</math>  <math>v(x) = 3(x-4)(x-7)</math></p>

$\frac{252}{1} = 252$   
 $\frac{252}{2} = 126$   
 $\frac{252}{3} = 84$   
 $\frac{252}{4} = 63$   
 $\frac{252}{6} = 42$   
 $\frac{252}{7} = 36$   
 $\frac{252}{9} = 28$   
 $\frac{252}{12} = 21$

8a.  $h = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$   
 $a=1$   
 $b=6$   
 $c=5$   $k = (-3)^2 + 6(-3) + 5 = 9 - 18 + 5 = -4$   
 $h = -3$   $k = -4$   
 $r_1 = -1$   
 $r_2 = -5$   
 $x^2 + 6x + 5 = (x+1)(x+5)$   
 $x = -1$   $x = -5$

8b.  $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(0)}}{2(-3)}$   
 $a = -3$   
 $b = 6$   
 $c = 0$   
 $x = \frac{6 \pm \sqrt{36 - 0}}{-6} = \frac{6 \pm 6}{-6}$   
 $x = \frac{6+6}{-6} = \frac{12}{-6} = -2$   
 $x = \frac{6-6}{-6} = \frac{0}{-6} = 0$   
 $r_1 = 0$   
 $r_2 = 2$   
 $h = \frac{r_1 + r_2}{2} = \frac{0+2}{2} = 1$   
 $k = -3(1)^2 + 6(1) = -3 + 6 = 3$

8c.  $2x^2 + 4x - 6$   
 $a=2$   
 $b=4$   
 $c=-6$   
 $h = \frac{-4}{2(2)} = \frac{-4}{4} = -1$   
 $k = 2(-1)^2 + 4(-1) - 6 = 2 - 4 - 6 = -8$   
 $0 = 2(x+1)^2 - 8$   
 $8 = 2(x+1)^2$   
 $4 = (x+1)^2$   
 $\pm\sqrt{4} = x+1$   
 $\pm 2 = x+1$   
 $-1 \pm 2 = x$   
 $-1+2 = 1$   
 $-1-2 = -3$   
 $r_1 = 1$   
 $r_2 = -3$

9a.  $-(x+4)^2 + 9$   
 $h = -4$   $k = 9$   
 $y$ -int:  $-(0+4)^2 + 9 = -16 + 9 = -7$   
 $(0, -7)$   
 roots:  
 $0 = -(x+4)^2 + 9$   
 $9 = (x+4)^2$   
 $\pm\sqrt{9} = x+4$   
 $\pm 3 = x+4$   
 $-4 \pm 3 = x$   
 $-4+3 = -1$   
 $-4-3 = -7$   
 $(-1, 0)$   $(-7, 0)$

9b. vert  $(2, -3)$   
 $y$ -int:  $3(0-2)^2 - 3 = 3(2)^2 - 3 = 12 - 3 = 9$   
 $y = 3(4) - 3 = 12 - 3 = 9$   
 $(0, 9)$   
 roots:  $0 = 3(x-2)^2 - 3$   
 $3 = 3(x-2)^2$   
 $1 = (x-2)^2$   
 $\pm\sqrt{1} = x-2$   
 $\pm 1 = x-2$   
 $2 \pm 1 = x$   
 $2+1 = 3$   
 $2-1 = 1$   
 $(3, 0)$   $(1, 0)$

9c. vertex  $(3, 8)$   
 $y$ -int:  $-2(0-3)^2 + 8 = -2(3)^2 + 8 = -18 + 8 = -10$   
 $(0, -10)$   
 roots:  $0 = -2(x-3)^2 + 8$   
 $-8 = -2(x-3)^2$   
 $4 = (x-3)^2$   
 $\pm\sqrt{4} = x-3$   
 $\pm 2 = x-3$   
 $3 \pm 2 = x$   
 $x = 3+2 = 5$   
 $x = 3-2 = 1$   
 $(5, 0)$   $(1, 0)$

10a.  $3(x-1)(x+1)$   
 roots:  $x=1$   $x=-1$   
 $(1, 0)$   $(-1, 0)$   
 vertex:  $h = \frac{1+(-1)}{2} = \frac{0}{2} = 0$   
 $k = 3(0-1)(0+1) = 3(-1)(1) = -3$   
 $(0, -3)$   
 $y$ -int:

10b.  $-(x+3)(x+3)$   
 roots:  $x = -3$   
 $(-3, 0)$   
 vertex:  $h = \frac{-3+(-3)}{2} = \frac{-6}{2} = -3$   
 $k = -(-3+3)(-3+3) = 0$   
 $(-3, 0)$   
 $y$ -int:  $-(0+3)(0+3) = -(3)(3) = -9$   
 $(0, -9)$

10c.  $(x+2)(x-4)$  roots:  $x = -2$   $x = 4$   
 $(-2, 0)$   $(4, 0)$   
 vertex:  $h = \frac{-2+4}{2} = \frac{2}{2} = 1$   
 $k = (1+2)(1-4) = (3)(-3) = -9$   
 $(1, -9)$   
 $y$ -int:  $(0+2)(0-4) = (2)(-4) = -8$   
 $(0, -8)$