

Unit 3 Review Problems

*Typo #2

[=0]

Complete the following problems to better prepare for your last test of the quarter. You might also want to look at HW Packet 6, Inv. 13 and 14, as well as "Factoring when Leading Coefficient is Not 1 - Notes" and "Factoring when... - Practice" and "Operations on Complex Numbers." You must have at least 50% of each problem completed to earn full credit when collected on Test Day. Good luck!

1. Factor the following:

a) $x^2 + 4x - 32$
 $(x+8)(x-4)$

b) $12x^2 + 5x - 2$

$(3x+2)(4x-1)$

$12x^2 - 3x + 8x - 2$

c) $3x^2 - 3x - 90$

$3(x-6)(x+5)$

$x^2 - x - 30$

d) $25x^2 - 16$

$(5x-4)(5x+4)$

e) $-2x^2 - 6x + 56$

$-2(x+7)(x-4)$

$x^2 + 3x - 28$

f) $6x^2 - 11x + 4$

$(3x-4)(2x-1)$

$6x^2 - 3x - 8x + 4$

g) $5x^2 - 50x + 120$

$5(x-6)(x-4)$

$x^2 - 10x + 24$

h) $9x^2 + 12x + 4$

$(3x+2)^2$

i) $49 - 100x^2$

$(7-10x)(7+10x)$

2. Solve the following problems using your results from Problem (1)

a) $x^2 + 4x - 32 = 0$

$x = -8, 4$

b) $12x^2 + 5x - 2 = 0$

$x = \frac{1}{4}, -\frac{2}{3}$

c) $3x^2 - 3x - 90 = 0$

$x = 6, -5$

d) $25x^2 - 16 = 0$

$x = \pm 0.8$

e) $-2x^2 - 6x + 56 = 0$

$x = -7, 4$

f) $6x^2 - 11x + 4 = 0$

$x = \frac{4}{3}, 0.5$

$(3x-4)(2x-1) = 0$

$3x-4=0$

$3x=4$

$x = \frac{4}{3}$

$2x-1=0$

$2x=1$

$x = \frac{1}{2}$

g) $5x^2 - 50x + 120 = 0$

$x = 6, 4$

h) $9x^2 + 12x + 4 = 0$

$x = -\frac{2}{3}$

i) $49 - 100x^2 = 0$ $(7+10x)(7-10x)$
 $7+10x=0$
 $x = -0.7, 0.7$

3. Express each of the following quadratic functions in (a) x-intercept form by factoring the equation and (b) vertex form by completing the square. Then find the coordinates of the given points using whichever form is easiest.

a) $f(x) = x^2 - 12x + 11$

$= (x^2 - 12x + 36) + 11 - 36$

$= (x-6)^2 - 25$



x-intercept form: $f(x) = (x-11)(x-1)$

vertex form: $f(x) = (x-6)^2 - 25$

x-intercepts: $(11, 0)$ $(1, 0)$

y-intercept: $(0, 11)$

vertex point $(6, 25)$

b) $f(x) = x^2 + 9x + 20$

$$\begin{array}{r} 5 \\ 20 \times 4 \\ 9 \end{array}$$

$$\begin{aligned} &= (x^2 + 9x + 20.25) - 20.25 \\ &= (x + 4.5) - 0.25 \end{aligned}$$

x-intercept form: $f(x) = (x+5)(x+4)$

vertex form: $f(x) = (x+4.5)^2 - 0.25$

x-intercepts: $(-5, 0)$ $(-4, 0)$

y-intercept: $(0, 20)$

vertex point $(-4.5, -0.25)$

c) $f(x) = x^2 - 8x + 7$

$$\begin{array}{r} -4 \\ -1 \times 7 \\ -8 \end{array}$$

$$\begin{aligned} &= (x^2 - 8x + 16) + 7 - 16 \\ &= (x - 4)^2 - 9 \end{aligned}$$

x-intercept form: $f(x) = (x-7)(x-1)$

vertex form: $f(x) = (x-4)^2 - 9$

x-intercepts: $(7, 0)$ $(1, 0)$

y-intercept: $(0, 7)$

vertex point $(4, -9)$

d) $f(x) = x^2 - 2x - 80$

$$\begin{array}{r} -1 \\ -80 \times 8 \\ -2 \end{array}$$

$$\begin{aligned} &= (x^2 - 2x + 1) - 80 - 1 \\ &= (x - 1)^2 - 81 \end{aligned}$$

x-intercept form: $f(x) = (x-10)(x+8)$

vertex form: $f(x) = (x+1)^2 - 81$

x-intercepts: $(10, 0)$ $(-8, 0)$

y-intercept: $(0, -80)$

vertex point $(-1, -81)$

e) $f(x) = x^2 + 6x + 5$

$$\begin{aligned} &= (x^2 + 6x + 9) + 5 - 9 \\ &= (x + 3)^2 - 4 \end{aligned}$$

x-intercept form: $f(x) = (x+5)(x+1)$

vertex form: $f(x) = (x+3)^2 - 4$

x-intercepts: $(-5, 0)$ $(-1, 0)$

y-intercept: $(0, 5)$

vertex point $(-3, -4)$

4. Find the max/min point, x-intercepts, and y-intercept of the function:

$$f(x) = (x + 2)^2 - 9$$

5. Simplify the following complex numbers by performing the indicated operations. Leave answers in standard form, $a+bi$.

a) $(5 + 6i) - (3 - 9i) - (-2 - 7i)$

$$5 + 6i - 3 + 9i + 2 + 7i$$
$$4 + 22i$$

b) $(7 + 9i) - (2 + 11i)$

$$5 - 2i$$

c) $(7 + 9i) + (2 + 11i)$

$$9 + 20i$$

d) $(-2 - i)(4 + i)$ $-8 - 2i - 4i - i^2$

$$-7 - 6i$$

e) $i(-5 - 8i)$

$$-5i - 8i^2$$
$$8 - 5i$$

f) $(1 - 2i)^2 (1 - 2i)$

$$1 - 2i - 2i + 4i^2$$
$$-3 - 4i$$

g) $5i + 8i \cdot i$

$$-8 + 5i$$

h) $6i - 5(10 + 4i)$

$$6i - 50 - 20i$$
$$-50 - 14i$$

i) $-3i \cdot 6i - 3(-7 + 6i)$

$$-18i^2 + 21 - 18i$$
$$39 - 18i$$

j) $(3 + 3i) + (8 - 2i) - 7$

$$4 + i$$

6. Use the quadratic formula to solve each of the following equations. Leave all irrational answers in exact form. Write nonreal complex numbers in standard form $a+bi$. You must also identify each solution as an integer, rational number, irrational number, or complex number.

A=2 B=1 C=-3
 a) $2x^2 + x - 3 = 0$

$$X = \frac{-1}{2(2)} \pm \frac{\sqrt{1^2 - 4(2)(-3)}}{2(2)}$$

$$= \frac{-1}{4} \pm \frac{\sqrt{25}}{4}$$

$$= -1/4 \pm 5/4$$

$$x = \underline{1}$$

Type: Integer

(integer, rational, irrational, complex - choose one)

$$x = \underline{-1.5}$$

Type: Rat.

A=2 B=5 C=-1
 b) $2x^2 + 5x - 1 = 0$

$$X = \frac{-5}{2(2)} \pm \frac{\sqrt{5^2 - 4(2)(-1)}}{2(2)}$$

$$= \frac{-5}{4} \pm \frac{\sqrt{33}}{4}$$

$$= \frac{-5 \pm \sqrt{33}}{4}$$

$$x = \frac{-5 + \sqrt{33}}{4}$$

Type: Irrational

$$x = \frac{-5 - \sqrt{33}}{4}$$

Type: Irr.

c) $5x^2 - 6x + 2 = 0$

$$X = \frac{6}{2(5)} \pm \frac{\sqrt{(-6)^2 - 4(5)(2)}}{2(5)}$$

$$= \frac{6}{10} \pm \frac{\sqrt{-4}}{10}$$

$$= \frac{3}{5} \pm \frac{2i}{10}$$

$$= \frac{3}{5} \pm \frac{1}{5}i$$

$$x = \frac{3}{5} + \frac{1}{5}i$$

Type: Complex

$$x = \frac{3}{5} - \frac{1}{5}i$$

Type: Complex

d) $x^2 + 9x - 10 = -24$

$x = \underline{-2}$

Type: Integer

$x = \underline{-7}$

Type: Integer

e) $x^2 - 6x + 13 = 0$

$$x = \frac{6 \pm \sqrt{36 - 4(1)(13)}}{2}$$

$$= 3 \pm \frac{\sqrt{-16}}{2}$$

$$= 3 \pm \frac{4\sqrt{-1}}{2} = 3 \pm 2i$$

$x = \underline{3+2i}$

Type: Complex

$x = \underline{3-2i}$

Type: Complex

f) $3x^2 - 18x + 30 = 0$

$$x = \frac{18 \pm \sqrt{(-18)^2 - 4(3)(30)}}{2(3)}$$

$$= \frac{18 \pm \sqrt{-36}}{6}$$

$$= 3 \pm \frac{6\sqrt{-1}}{6}$$

$$= 3 \pm 1i$$

$x = \underline{3+1i}$

Type: Complex

$x = \underline{3-1i}$

Type: Complex