

Math 3

Name _____

Polynomial and Rational Function

Date _____

Lesson 2 Practice Quiz

1. Consider the quadratic function $f(x) = x^2 + 6x + 2$. Complete each task by algebraic reasoning alone. Show all of your work to support your answer.

→ complete the square

- a. Rewrite the function in vertex form.

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

$$f(x) + 7 = (x+3)^2$$

$$f(x) - 2 = x^2 + 6x + 9$$

$$f(x) = (x+3)^2 - 7$$

- b. Does the graph of this function have a maximum or minimum? Determine the coordinates of the maximum or minimum point of the graph of this function.

min value is 'a' is positive.

$$(-3, -7)$$

- c. What are the coordinates of the x-intercepts of the graph of this function?

$$0 = (x+3)^2 - 7$$

$$\sqrt{7} = \sqrt{(x+3)^2}$$

$$\pm\sqrt{7} = x+3$$

$$x = -3 \pm \sqrt{7}$$

- d. What are the coordinates of the y-intercept of the graph of this function?

Let $x=0$

$$f(x) = (x+3)^2 - 7$$

$$(0+3)^2 - 7$$

$$9 - 7$$

$$2$$

$$(0, 2)$$

2. Rewrite each quadratic in vertex form and give the vertex.

$$3 + \frac{1}{4} = 3\frac{1}{4} = \frac{13}{4}$$

a. $y = x^2 - 6x - 11$

$$y + 11 = x^2 - 6x + 9$$

$$y + 20 = (x - 3)^2$$

$$y = (x - 3)^2 - 20$$

$$V(3, -20)$$

b. $y = x^2 - x - 3$

$$y + 3 = x^2 - x + \frac{1}{4}$$

$$y + \frac{13}{4} = (x - \frac{1}{2})^2$$

$$y = (x - \frac{1}{2})^2 - \frac{13}{4}$$

$$V(\frac{1}{2}, -\frac{13}{4})$$

c. $y = x^2 + 12x - 10$

$$y + 10 = x^2 + 12x + 36$$

$$y + 46 = (x + 6)^2$$

$$y = (x + 6)^2 - 46$$

$$V(-6, -46)$$

3. Use the quadratic formula, factoring, or complete the square to solve each of these quadratics. Identify each solution as rational, irrational, or complex. Write non-real complex solutions in standard form $a + bi$. Must use each method once.

a. $2x^2 + 3x - 5 = 0$

$$(2x + 5)(x - 1) = 0$$

$$2x + 5 = 0 \quad x - 1 = 0$$

$$x = -\frac{5}{2} \quad x = 1$$

Rational

b. $2x^2 + x - 3 = 0$

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

$$2x + 3 = 0 \quad x - 1 = 0$$

$$x = -\frac{3}{2} \quad x = 1$$

Rational

c. $3x^2 + x + 10 = 0$

$$\frac{-1 \pm \sqrt{1^2 - 4(3)(10)}}{2(3)}$$

$$= \frac{-1 \pm \sqrt{1 - 120}}{6}$$

$$= \frac{-1 \pm \sqrt{-119}}{6} = \frac{-1 \pm i\sqrt{119}}{6}$$

Complex $-\frac{1}{6} \pm \frac{\sqrt{119}}{6}i$

d. $x^2 + 5x + 10 = 0$

$$x^2 + 5x + \frac{25}{4} = -10 + \frac{25}{4}$$

$$\sqrt{(x + \frac{5}{2})^2} = \sqrt{\frac{-15}{4}}$$

$$x + \frac{5}{2} = \pm \frac{\sqrt{-15}}{2}$$

Complex $x = -\frac{5}{2} \pm \frac{\sqrt{15}}{2}i$

e. $3x^2 + 2x + 1 = 0$

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

$$= \frac{-2 \pm \sqrt{4 - 12}}{6}$$

$$= \frac{-2 \pm \sqrt{-8}}{6} = \frac{-2 \pm i\sqrt{8}}{6}$$

Complex

f. $x^2 - 5x = -5$

$$x^2 - 5x + \frac{25}{4} = -5 + \frac{25}{4}$$

$$\sqrt{(x - \frac{5}{2})^2} = \sqrt{\frac{5}{4}}$$

$$x - \frac{5}{2} = \pm \frac{\sqrt{5}}{2}$$

$$x = \frac{5}{2} \pm \frac{\sqrt{5}}{2}$$

Irrational

g. $4x(x+5)+29=0$

$$4x^2+20x+29=0$$

$$x^2+5x+\frac{29}{4}=0$$

$$x^2+5x+\frac{25}{4}=-\frac{29}{4}+\frac{25}{4}$$

$$\left(x+\frac{5}{2}\right)^2=-1$$

$$x+\frac{5}{2}=\pm\sqrt{-1} \quad x=-\frac{5}{2}\pm i$$

$$x+\frac{5}{2}\pm i \text{ complex}$$

4. Write $y=(x-4)(x+9)$ in standard form.

$$y=x^2+5x-36$$

h. $9x^2-6x+2=0$

$$\frac{6 \pm \sqrt{(-6)^2 - 4(9)(2)}}{2(9)}$$

$$\frac{6 \pm \sqrt{36-72}}{18}$$

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

$$\frac{6 \pm 6i}{18} = \frac{6}{18} \pm \frac{6}{18}i$$

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

$$y=ax^2+bx+c$$

5. Write $y=-2(x+5)^2+2$ in standard form.

$$-2(x+5)(x+5)+2$$

$$-2(x^2+10x+25)+2$$

$$-2x^2-20x-50+2$$

$$-2x^2-20x-48$$

6. Write $y=2(x-2)^2-2$ in intercept form.

$$2(x-2)(x-2)-2$$

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

$$2x^2-8x+8-2$$

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

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

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

7. Perform the indicated operation and write your answer in standard form.

$a+bi$

a. $(3 + 4i) + (5 - 6i)$

$$8 - 2i$$

b. $(7 - 3i) - (4 + 2i)$

$$3 - 5i$$

b. $(5 - 6i) + 5i + (7 + 6i)$

$$12 + 5i$$

d. $(-1 + i) - (-7 + 4i) - 5$

$$-1 + i + 7 - 4i - 5$$

$$1 - 3i$$

e. $2i(7 + 2i)$

$$14i + 4i^2$$

$$14i + 4(-1)$$

$$-4 + 14i$$

f. $(5 - 4i)(2 + 3i)$

$$10 + 15i - 8i - 12i^2$$

$$10 + 7i + 12$$

$$22 + 7i$$

g. $(-2 + 4i)^2$

$$(-2 + 4i)(-2 + 4i)$$

$$4 - 8i - 8i + 16i^2$$

$$4 - 16i - 16$$

$$-12 - 16i$$

$$i^2 = -1$$