

Review 4 Notes

Quadratics

1) Find the following for the quadratic $y = -3x^2 + 2x + 4$.

a) The maximum or minimum value.

$$4.33 \leftarrow$$

b) The axis of symmetry

$$x = 0.33$$

c) The vertex

$$(0.33, 4.33)$$

d) The range

$$y \leq 4.33$$

e) Rewrite the equation in vertex form

$$y = -3(x - 0.33)^2 + 4.33$$

Vertex form:

$$y = a(x - h)^2 + k$$

Standard form:

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

x max/min value:

$$x = \frac{-b}{2a}$$

$$x = \frac{-2}{2(-3)} = \frac{1}{3} = 0.33$$

$$y = -3(0.33)^2 + 2(0.33) + 4 = 4.33$$

2) Factor the following.

a) $x^2 + 10x + 16$

$$(x+8)(x+2)$$

b) $x^2 + 15x + 36$

$$(x+3)(x+12)$$

c) $-x^2 - 6x + 27$

$$-(x^2 + 6x - 27)$$

$$-(x+9)(x-3)$$

d) $2m^2 + 30m + 108$

$$2(m^2 + 15m + 54)$$

$$2(m+6)(m+9)$$

2) (Continued) Factor

e) $5x^2 - 10x$

$$5x(x - 2)$$

f) $12x^2 - 28x - 5$

$$x^2 - 28x - 60$$

$$(x - \frac{30}{12})(x + \frac{2}{12})$$

$$(x - \frac{5}{2})(x + \frac{1}{6}) \rightarrow (2x - 5)(6x + 1)$$

3) Use the quadratic formula to solve.

a) $x^2 + 13x + 36 = 0$

$$x = \frac{-13 \pm \sqrt{13^2 - 4(1)(36)}}{2(1)} = \frac{-13 \pm \sqrt{25}}{2}$$

$$= \frac{-13 \pm 5}{2} \rightarrow -4, -9$$

b) $-2x^2 - 3x + 1 = 0$

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

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(-2)(1)}}{2(-2)} = \frac{3 \pm \sqrt{17}}{-4}$$

4) Solve the following equations.

a) $5x^2 = 15$

$$\frac{5x^2}{5} = \frac{15}{5}$$

$$x^2 = 3$$

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

b) $x^2 + 6x + 9 = 16$

$$(x + 3)^2 = 16$$

$$x + 3 = \pm 4$$

$$-3 \quad -3$$

$$x = -3 \pm 4 = 1, -7$$

5) What value completes the square in the expression?

$x^2 - 10x + \underline{25}$

$$(\frac{-10}{2})^2 = 25$$

$$(\frac{b}{2})^2$$

6) Solve by completing the square.

$x^2 + 10x + 7 = 0$

$$x^2 + 10x = -7$$

$$x^2 + 10x + (\frac{10}{2})^2 = -7 + (\frac{10}{2})^2$$

$$x^2 + 10x + 25 = 18$$

$$(x + 5)^2 = 18$$

$$x + 5 = \pm \sqrt{18}$$

$$x = -5 \pm \sqrt{18}$$

1. $ax^2 + bx = c$
2. If $a \neq 1$, divide by a .
3. Add $(\frac{b}{2})^2$ to both sides
4. Factor
5. Solve for x

7) Use the discriminant to determine the number of real solutions.

a) $x^2 - 6x + 9 = 0$

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

$D = (-6)^2 - 4(1)(9) = 0$ one solution.

$D = 2^2 - 4(5)(-1) = 24$

Two solutions.

$D = b^2 - 4ac$
 $D > 0$, two solutions (real)
 $D = 0$, one solution (real)
 $D < 0$, zero solutions (real)

8) Simplify the following.

a) $(3 + 4i) - (2 + 11i)$

b) $(5 - i)(3 + 2i)$

$3 + 4i - 2 - 11i$

$15 + 10i - 3i - 2i^2$

$1 - 7i$

$15 + 7i - 2(-1)$

$17 + 7i$

$i^2 = -1$
 $i = \sqrt{-1}$

c) $(2 + 4i) + (5 + 9i)$

d) $\frac{4+2i}{3-5i}(3+5i)$

$7 + 13i$

$= \frac{12 + 20i + 6i + 10i^2}{9 + 15i - 15i - 25i^2}$

$= \frac{12 + 26i + 10(-1)}{9 + 25} = \frac{2 + 26i}{34}$

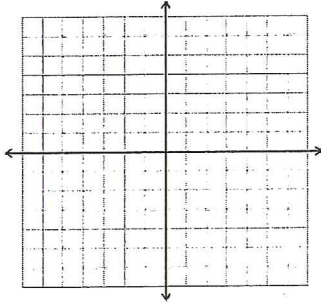
e) $\sqrt{-5} = i\sqrt{5}$

f) $\sqrt{-49} = 7i$

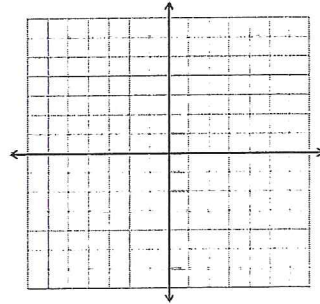
Exponentials

9) Graph

a) $y = (2)^x$



b) $y = 3(1/4)^x$



10) You own a business that is growing exponentially at a rate of 6.3% per year. The current number of employees is 50, and you like to know about how many employees you will have in 5 years if the company continues to grow at the same rate. How many people will you have?

$$A = a(1+r)^t$$

11) An account is compounded continuously with an interest rate of 2.2%. The principal amount is \$5000. How much is in the account after 7 years?

$$A = P \cdot e^{rt}$$