

I. Polynomials

or subtract the following polynomials:

1.)  $(10x^4 - 16) + (12 - 6x^3 + 11x^4)$

$$21x^4 - 6x^3 - 4$$

2.)  $(20x + 11x^4) - (15x + 16x^2 - 17x^4)$

$$20x + 11x^4 - 15x - 16x^2 + 17x^4$$

$$28x^4 - 16x^2 + 5x$$

3.)  $(7x^3 + 11) - (11x^4 + 13 + 16x^2)$

$$7x^3 + 11 - 11x^4 - 13 - 16x^2$$

$$-11x^4 + 7x^3 - 16x^2 - 2$$

4.)  $(14 + 12x^3) + (17x^4 + 15 - 5x^3)$

$$17x^4 + 7x^3 + 29$$

Multiply the following polynomials:

5.)  $(6x + 8)(5x - 8)$

$$30x^2 - 48x + 40x - 64$$

$$30x^2 - 8x - 64$$

6.)  $(3x^3 + 5)(2x - 7)$

$$6x^4 - 21x^3 + 10x - 35$$

7.)  $(2x - 1)^2$

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

$$4x^2 - 2x - 2x + 1$$

$$4x^2 - 4x + 1$$

8.)  $(x - 3)(3x^2 + 4x - 5)$

$$= 3x^3 + 4x^2 - 5x - 9x^2 - 12x + 15$$

$$= 3x^3 - 5x^2 - 17x + 15$$

Factor the following polynomials.

9.)  $y = x^2 - 10x + 21$

$$y = (x - 7)(x - 3)$$

10.)  $y = x^2 - 1x - 12$

$$y = (x - 4)(x + 3)$$

11.)  $y = x^2 - 10x - 24$

$$y = (x - 12)(x + 2)$$

Rewrite the following equations in vertex form by completing the square:

11.)  $y = x^2 + 6x + 8$

$$x^2 + 6x + 8 = 0$$

$$x^2 + 6x + \frac{9}{2} = -8 + \frac{9}{2}$$

$$(x + 3)^2 = 1$$

$$y = (x + 3)^2 - 1$$

13.)  $y = x^2 + 14x - 38$

$$x^2 + 14x - 38 = 0$$

$$x^2 + 14x + \frac{49}{2} = 38 + \frac{49}{2}$$

$$(x + 7)^2 = 87$$

$$y = (x + 7)^2 - 87$$

14.)  $y = 6x^2 + 12x - 48$

$$6(x^2 + 2x + 1) = 48 + 6$$

$$6(x + 1)^2 = 54$$

$$y = 6(x + 1)^2 - 54$$

## II. Forms of an equation:

13.) What are the equations for the three forms of a quadratic?

Standard Form:  $y = ax^2 + bx + c$

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

Factored Form:  $y = a(x+p)(x+q)$

14.) How do we change from one form of a quadratic to another?

How to change from standard to factored form? by factoring

How to change from factored to standard form? FOIL or multiply

How to change from standard to vertex form? Complete the Square

How to change from vertex to standard form? FOIL, distribute, then add like terms

\* How to change from vertex to factored form? FOIL, distribute, add like terms, then factor

\* How to change from factored to vertex form? FOIL, then complete the square

Given an equation in either standard form, factored form or vertex form, state the characteristics for each. Then graph on the grid provided.

15.)  $y = x^2 + 2x - 3$

Rewrite in Factored Form:  $y = (x+3)(x-1)$

Axis of symmetry:  $x = -1$

Vertex:  $(-1, -4)$

x-intercepts:  $(-3, 0), (1, 0)$

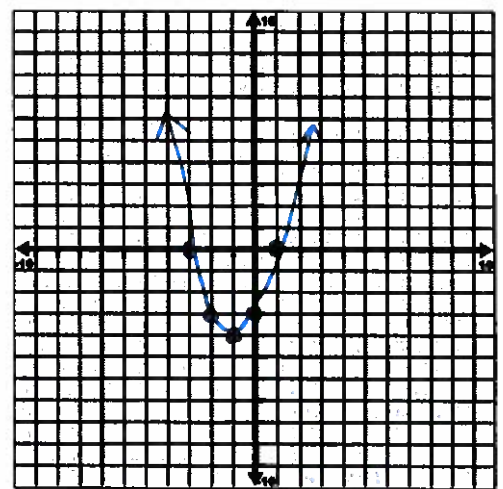
y-intercept:  $(0, -3)$

Domain:  $\mathbb{R}$

Range:  $[-4, \infty)$

Increasing interval:  $(-1, \infty)$

Decreasing interval:  $(-\infty, -1)$



Transformations:  
left 1, down 4

16.)  $y = (x - 3)^2 + 1$

Rewrite in Standard Form:  $y = x^2 - 6x + 10$

Axis of symmetry:  $x = 3$

Vertex:  $(3, 1)$

x-intercepts: None

y-intercept:  $(0, 10)$

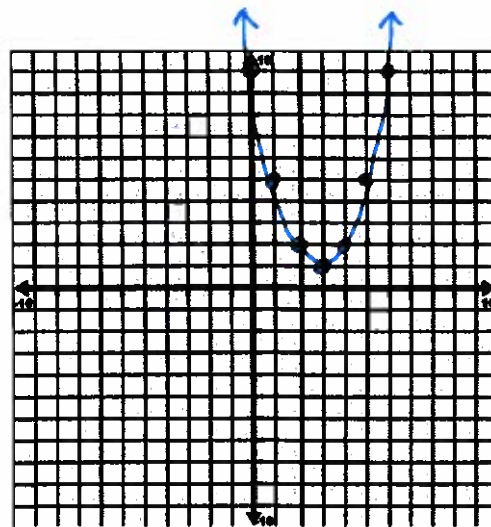
Domain:  $\mathbb{R}$

Range:  $[1, \infty)$

Increasing interval:  $(3, \infty)$

Decreasing interval:  $(-\infty, 3)$

$$\begin{aligned} &(x-3)^2 + 1 \\ &= (x-3)(x-3) + 1 \\ &= x^2 - 6x + 9 + 1 \\ &= x^2 - 6x + 10 \end{aligned}$$



Transformations:  
right 3, up 1

17.)  $y = x^2 + 6x + 5$

Rewrite in Vertex Form:  $y = (x+3)^2 - 4$

Axis of symmetry:  $x = -3$

Vertex:  $(-3, -4)$

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

y-intercept:  $(0, 5)$

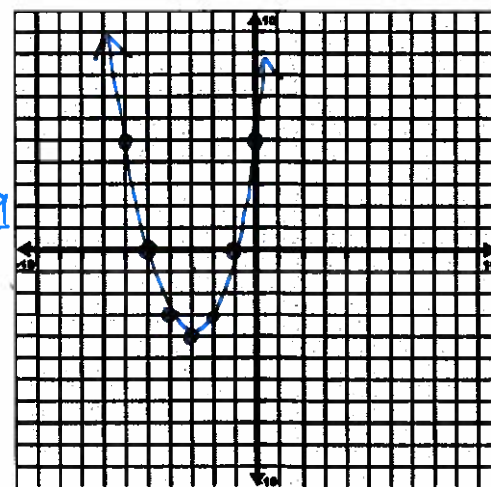
Domain:  $\mathbb{R}$

Range:  $[-4, \infty)$

Increasing interval:  $(-3, \infty)$

Decreasing interval:  $(-\infty, -3)$

$$\begin{aligned} &x^2 + 6x + 5 = 0 \\ &x^2 + 6x + 9 = -5 + 9 \\ &(x+3)^2 = 4 \\ &y = (x+3)^2 - 4 \end{aligned}$$



Transformations:  
left 3, down 4

18.)  $y = (x - 1)(x + 5)$

Rewrite in Standard Form:  $x^2 + 4x - 5$

Axis of symmetry:  $x = -2$

Vertex:  $(-2, -9)$

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

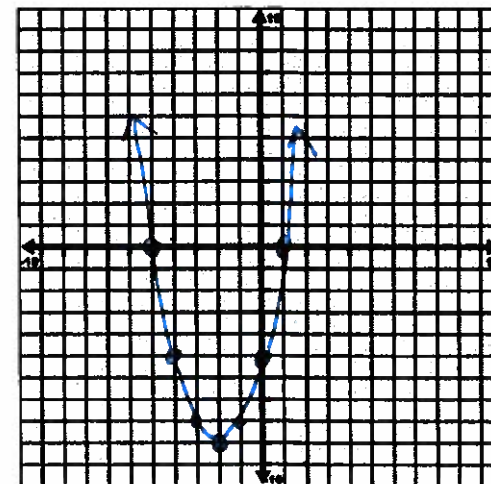
y-intercept:  $(0, -5)$

Domain:  $\mathbb{R}$

Range:  $[-9, \infty)$

Increasing interval:  $(-2, \infty)$

Decreasing interval:  $(-\infty, -2)$

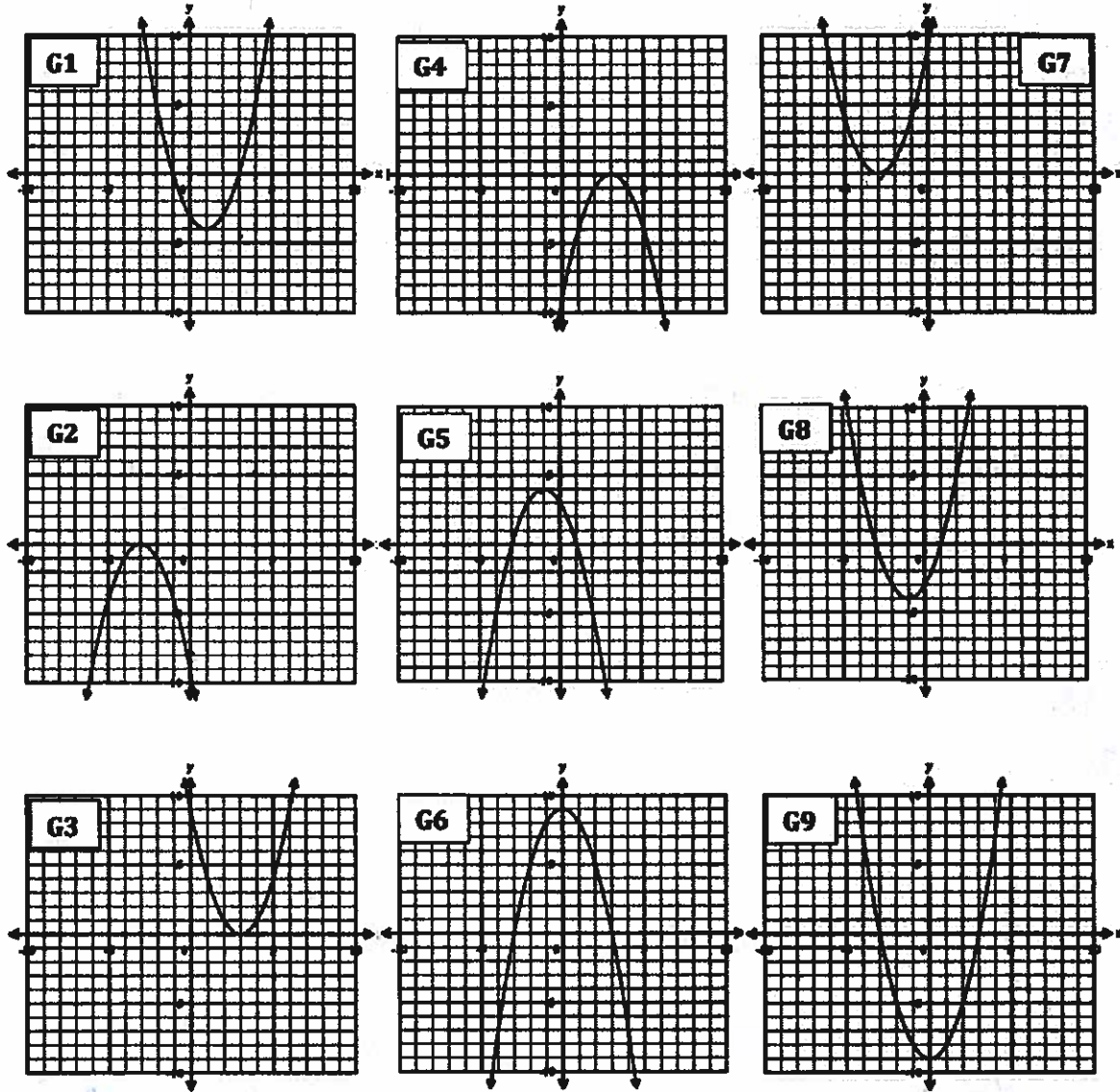


Transformations:  
left 2, down 9

Match the following graphs with a standard form equation and a vertex form equation

- 19.) G1, V1, S2  
 21.) G3, V6, S3  
 23.) G5, V3, S1  
 25.) G7, V2, S8  
 27.) G9, V8, S9

- 20.) G2, V9, S5  
 22.) G4, V5, S7  
 24.) G6, V4, S6  
 26.) G8, V7, S4



- |  |  |   |   |   |   |
|--|--|---|---|---|---|
| <del>V1<br/><math>f(x) = (x-1)^2 - 4</math></del>  | <del>V4<br/><math>f(x) = -x^2 + 9</math></del> | <del>V7<br/><math>f(x) = (x+1)^2 - 4</math></del> | <del>S1<br/><math>f(x) = -x^2 - 2x + 3</math></del> | <del>S4<br/><math>f(x) = x^2 + 2x - 3</math></del>  | <del>S7<br/><math>f(x) = -x^2 + 6x - 9</math></del> |
| <del>V2<br/><math>f(x) = (x+3)^2</math></del>      | <del>V5<br/><math>f(x) = -(x-3)^2</math></del> | <del>V8<br/><math>f(x) = x^2 - 9</math></del>     | <del>S2<br/><math>f(x) = x^2 - 2x - 3</math></del>  | <del>S5<br/><math>f(x) = -x^2 - 6x - 9</math></del> | <del>S8<br/><math>f(x) = x^2 + 6x + 9</math></del>  |
| <del>V3<br/><math>f(x) = -(x+1)^2 + 4</math></del> | <del>V6<br/><math>f(x) = (x-3)^2</math></del>  | <del>V9<br/><math>f(x) = -(x+3)^2</math></del>    | <del>S3<br/><math>f(x) = x^2 - 6x + 9</math></del>  | <del>S6<br/><math>f(x) = -x^2 + 9</math></del>      | <del>S9<br/><math>f(x) = x^2 - 9</math></del>       |