1.6 Factored Form

Part I: Looking back at linear functions.

Consider the function: $f(x) = 2x - 6$

1. Identify the y-intercept by substituting 0 for x.
2. Identify the x-intercept substituting 0 for $f(x)$.
3. Using the intercepts, graph the function.

Calculating the x and y-intercepts of a function is a slick way to graph the function. We can use this technique for other functions that are not linear, such as quadratic functions.

Part II: The Zero Product Rule

1. Determine $0 \cdot 5 \cdot 12 \cdot 119$
2. Determine $(-7) \cdot (315) \cdot (0) \cdot (89)$
3. Determine $(13)(21)(0)$
4. What can you conclude from the example problems above?
5. If $(x - 4)(x + 8) = 0$, find the value(s) for x. Show your work and explain how you got your answers.
6. If we are given $(x - 4)(x + 8)(x - 2)$ and their product is 0, then one of the individual factors MUST be 0.
   Therefore, $(x - 4)(x + 8)(x - 2) = 0$ for which values of x?
7. Solve $(x - 10)(x + 6) = 0$
8. Solve $(2x - 8)(x - 12) = 0$
9. Solve $(3x - 2)(5 - x) = 0$
10. Solve $(x - A)(x - B) = 0$

In general, to determine when a product of linear factors is equal to 0, just set each individual factor equal to 0 and solve. This zero-product rule will make our work with quadratic functions much easier!

When a function is expressed in factored form (written as a product of linear factors), we can, by the zero-product rule, determine its x-intercepts simply by setting each factor equal to 0.

Part III: Identify the key features and graph the quadratic function q(x) = (2x – 6)(x – 7)

1. Determine the y-intercept.
2. Determine the x-intercepts.
3. The symmetry of parabolas allows us to use the x-intercepts of a quadratic function to determine its vertex.
   In general, if a quadratic function has two x-intercepts, the x-coordinate of its vertex must be midway between the two x-intercepts.
4. Using the intercepts you found above, determine the value that is midway between (call it m). Explain how you determined this value.
5. Calculate q(m). Then, identify the vertex.
6. Using the four key points you determined from #1-5, complete the table of values to the right and graph the function.

Key Point	**x-value**	**y-value**
y-intercept	0	
x-intercept		0
x-intercept		0
vertex	5	

In general, when a quadratic function is presented in factored form, you can easily determine the following to graph the function:

a. y-intercept
b. x-intercepts
c. vertex (using the point midway between the x-intercepts)

Part IV: You try it now!

Determine the key points (y-intercept, both x-intercepts, vertex) for each function below. Then, use those four key points to graph the function.

1. $f(x) = (x - 1)(x - 3)$
2. $g(x) = (x + 1)(x - 3)$
3. $h(x) = (x + 1)(x + 3)$
4. $k(x) = -2(x - 1)(x - 3)$