

Zeros of Polynomials

Writing a Function Given the Zeros

Ex) Write a function with the given the zeros. -1, 1, 6

If a polynomial has zeros, then you can write:

- $x = -1$ $(x + 1)$
- $x = 1$ $(x - 1)$
- $x = 6$ $(x - 6)$

So, we have $(x + 1)(x - 1)(x - 6) = x^3 - 6x^2 - x + 6$

✓ Ex) Write a function with the given the zeros.

✓ a) 5, -4, 1

$$\begin{aligned}
 &(x - 5)(x + 4)(x - 1) \\
 &(x - 5)(x^2 - x + 4x - 4) \\
 &(x - 5)(x^2 + 3x - 4) \\
 &x^3 + 3x^2 - 4x - 5x^2 - 15x + 20 \\
 &\boxed{x^3 - 2x^2 - 19x + 20}
 \end{aligned}$$

✓ b) 2, -2, 3

$$\begin{aligned}
 &(x - 2)(x + 2)(x - 3) \\
 &(x - 2)(x^2 - 3x + 2x - 6) \\
 &(x - 2)(x^2 - x - 6) \\
 &x^3 - x^2 - 6x - 2x^2 + 2x + 12 \\
 &\boxed{x^3 - 3x^2 - 4x + 12}
 \end{aligned}$$

Finding/Writing the Equation of a Line

Given a Point the Line Passes Through and a Line it is Perpendicular to

1. Find the slope of the given line, and use this to get the slope of the new line - it is the opposite reciprocal
2. Use this new slope and the given point to plug into the equation $y - y_1 = m(x - x_1)$, and solve this for y to get it into the form $y = mx + b$ *OR $y = mx + b$ to get b*

✓ Ex) Find the equation of the line that passes through the point (7, 2) and is perpendicular to $3x - 2y = 6$

$$\begin{aligned}
 \textcircled{1} \quad 3x - 2y &= 6 \rightarrow -2y = -3x + 6 \rightarrow y = \frac{3}{2}x - 3 \\
 m &= -\frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{2} \quad y - y_1 &= m(x - x_1) \\
 y - 2 &= -\frac{2}{3}(x - 7) \\
 y - 2 &= -\frac{2}{3}x + \frac{14}{3} \\
 &\rightarrow y = -\frac{2}{3}x + \frac{20}{3}
 \end{aligned}$$

✓ Ex) Find the equation of the line that passes through the point (-2, 6) and is perpendicular to $3x + 6y = 12$

$$\begin{aligned}
 \textcircled{1} \quad 3x + 6y &= 12 \rightarrow 6y = -3x + 12 \rightarrow y = -\frac{1}{2}x + 2 \\
 m &= 2
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{2} \quad y - y_1 &= m(x - x_1) = y - 6 = 2(x + 2) \rightarrow y - 6 = 2x + 4 \\
 &\rightarrow \boxed{y = 2x + 10}
 \end{aligned}$$