

Skills for the Factor Theorem

If $f(a) = 0$ in this case, then the binomial $(x - a)$ is a factor of polynomial $f(x)$. The possible integral roots of $P(x)$ must also be factors of the final constant term. This will limit the possible integral values to test.

Example: Identify all the possible integral roots of $P(x) = 2x^4 - 3x^3 + 2x - 3$ and then evaluate at each possible integral value to determine the integral roots of $P(x)$.

The possible integral values include $x = 1$, $x = -1$, $x = 3$, $x = -3$

$$P(1) = 2(1)^4 - 3(1)^3 + 2(1) - 3 = -2$$

$$P(-1) = 2(-1)^4 - 3(-1)^3 + 2(-1) - 3 = 0$$

$$P(3) = 2(3)^4 - 3(3)^3 + 2(3) - 3 = 84$$

$$P(-3) = 2(-3)^4 - 3(-3)^3 + 2(-3) - 3 = 234$$

Since $P(-1) = 0$, then I know that $x = -1$ is a root and that $(x + 1)$ is a factor of $P(x)$.

Finding Factors of Polynomials

- Identify all the possible integral roots of $P(x)$
- Evaluate at each possible integral value to
- Determine the integral roots of $P(x)$.

$$P(x) = 5x^2 + 6x - 8$$

$$f(x) = 4x^4 - x^3 - 8x^2 - 40$$

$$2x^3 + 5x^2 + 0x - 7$$

$$P(x) = 2x^4 - 3x^3 - 5x^2$$

$$P(x) = x^3 - 5x^2 - 10x + 24$$

$$P(x) = x^3 - 2x^2 - 5x + 6$$

$$P(x) = x^4 + 4x^3 + 3x^2 + 8x - 16$$

$$P(x) = x^4 - 3x^3 - x^2 + 7x - 4$$

$$P(x) = -4x^4 - 3x^3 + 2x^2 - 1x + 6$$

$$P(x) = x^4 - 11x^3 - 2x^2 + 2x + 10$$

Divide These Polynomials Using The AREA MODEL

Here is an example. Use what you know about the area model to fill out the length, width, and area.

$$(2x^3 - 2x^2 + 3x + 3) \div (x - 1)$$

The width is given in the problem. Then you have to work from the top left and fill out the boxes.

		$2x^2$	$+0x$	$+3$	
x	$2x^3$	$0x^2$	$3x$	Remainder	
-1	$-2x^2$	$0x$	-3	6	

$$= 2x^2 + 3 \text{ Remainder } 6$$

$$\frac{(4x^3 - 11x^2 + 8x + 6)}{(x - 2)}$$

$$\frac{(3x^3 - 2x^2 + 1)}{(x - 2)}$$

$$\frac{(x^3 + 0x^2 - 20x + 8)}{(x + 4)}$$

$$\frac{(-x + 3x^3 - 6 + 2x^2)}{(x + 2)}$$

$$\frac{4x^3 - 11x^2 + 8x + 10}{x - 2}$$

$$\frac{(2x^4 - 5x^3 + x - 4)}{(x - 2)}$$

$$\frac{(x^3 - 2x^2 - 33x + 90)}{(x - 5)}$$

$$\frac{(4x^5 - 30x^3 - 50x + 2)}{(x + 3)}$$

$$\frac{2x^3 + 6x^2 + 7x + 9}{2x + 1}$$

$$\frac{(6x^4 - 7x^3 + 4x^2 - 11x + 9)}{(2x - 1)}$$

$$\frac{4x^3 + 0x^2 + 5x + 16}{2x - 3}$$

$$\frac{(x^4 + 9x^3 - 5x^2 + 4)}{(x^2 - 4)}$$

What is the remainder when $2x^4 - 3x^3 + x^2 - 2x + 3$ is divided by $x + 1$?

Given $P(x) = x^3 - 4x^2 + 5x + 1$, determine the remainder when $P(x)$ is divided by $x - 1$.

Determine the remainder when $x^3 - 4x^2 + 5x - 1$ is divided by: $x - 2$.