

## Evaluating Polynomials

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Use direct substitution to evaluate  $f(x) = 2x^4 - 5x^3 - 8x + 3$  when  $x = 4$ .

$$\begin{aligned} \text{Evaluate: } & 2x^4 - 5x^3 - 8x + 3 \\ \text{when } & \\ x=4 & \quad 2(4)^4 - 5(4)^3 - 8(4) + 3 \\ & \quad 2(256) - 5(64) - 8(4) + 3 \\ & \quad 512 - 320 - 32 + 3 \\ & \quad 163 \end{aligned}$$

Synthetic Substitution:

$$2x^4 - 5x^3 - 8x + 3 \rightarrow 2x^4 - 5x^3 + 0x^2 - 8x + 3$$

$$\begin{array}{r|rrrrr} 4 & 2 & -5 & 0 & -8 & 3 \\ & \downarrow & & & & \\ & & 8 & 12 & 48 & 160 \\ \hline & 2 & 3 & 12 & 40 & 163 \end{array}$$

Evaluate if  $x = 3$

$$f(x) = 5x^3 + 3x^2 - 2x + 7$$

$$\begin{array}{r|rrrr} 3 & 5 & 3 & -2 & 7 \\ & \downarrow & & & \\ & & 15 & 54 & 156 \\ \hline & 5 & 18 & 52 & 163 \end{array}$$

Evaluate:

$$2x^2 + 3x - 5x^4 + 7 \text{ when } x = 1$$

$$-5x^4 + 0x^3 + 2x^2 + 3x + 7$$

$$\begin{array}{r|rrrrr} 1 & -5 & 0 & 2 & 3 & 7 \\ & \downarrow & & & & \\ & & -5 & -5 & -3 & 0 \\ \hline & -5 & -5 & -3 & 0 & 7 \end{array}$$