

Review Exercise Set 10

Exercise 1: Perform the following division operation using long division.

$$(2x^3 + x^2 - 13x + 6) \div (x - 2)$$

Exercise 2: Perform the following division operation using long division.

$$(3x^3 - 4x^2 - 13x - 6) \div (3x + 2)$$

Exercise 3: Perform the following division operation using synthetic division.

$$(6x^3 - 17x^2 - 26x - 8) \div (x - 4)$$

Exercise 4: Use synthetic division and the Remainder Theorem to find the indicated function value.

$$f(x) = -t^4 + 5t^2 + 4t - 20; f(3)$$

Exercise 5: Solve for the other zeros given that 4 is a zero of $f(x) = x^3 - 17x + 4$.

Review Exercise Set 10 Answer Key

Exercise 1: Perform the following division operation using long division.

$$(2x^3 + x^2 - 13x + 6) \div (x - 2)$$

Setup the problem in long division format

$$x - 2 \overline{) 2x^3 + x^2 - 13x + 6}$$

Divide the leading terms in the dividend and divisor

$$2x^3 / x = 2x^2$$

Multiply both terms in the divisor by the quotient and subtract from the dividend

$$\begin{array}{r} \overline{) 2x^3 + x^2 - 13x + 6} \\ \underline{2x^3 - 4x^2} \\ 5x^2 - 13x \end{array}$$

Divide the leading terms in the reduced dividend and divisor

$$5x^2 / x = 5x$$

Multiply both terms in the divisor by the quotient and subtract from the dividend

$$\begin{array}{r} \overline{) 2x^3 + x^2 - 13x + 6} \\ \underline{2x^3 - 4x^2} \\ 5x^2 - 13x \\ \underline{5x^2 - 10x} \\ -3x + 6 \end{array}$$

Divide the leading terms in the reduced dividend and divisor

$$-3x / x = -3$$

Exercise 1 (Continued):

Multiply both terms in the divisor by the quotient and subtract from the dividend

$$\begin{array}{r} 2x^2 + 5x - 3 \\ x - 2 \overline{) 2x^3 + x^2 - 13x + 6} \\ \underline{2x^3 - 4x^2} \\ 5x^2 - 13x \\ \underline{5x^2 - 10x} \\ -3x + 6 \\ \underline{-3x + 6} \\ 0 \end{array}$$

$$(2x^3 + x^2 - 13x + 6) \div (x - 2) = 2x^2 + 5x - 3$$

Exercise 2: Perform the following division operation using long division.

$$(3x^3 - 4x^2 - 13x - 6) \div (3x + 2)$$

$$\begin{array}{r} x^2 - 2x - 3 \\ 3x + 2 \overline{) 3x^3 - 4x^2 - 13x - 6} \\ \underline{3x^3 + 2x^2} \\ -6x^2 - 13x \\ \underline{-6x^2 - 4x} \\ -9x - 6 \\ \underline{-9x - 6} \\ 0 \end{array}$$

$$(3x^3 - 4x^2 - 13x - 6) \div (3x + 2) = x^2 - 2x - 3$$

Exercise 3: Perform the following division operation using synthetic division.

$$(6x^3 - 17x^2 - 26x - 8) \div (x - 4)$$

Set divisor equal to zero and solve for x

$$x - 4 = 0$$

$$x = 4$$

Setup the synthetic division using 4 and the coefficients of the terms in the polynomial.

$$\begin{array}{r|rrrrr} 4 & 6 & -17 & -26 & -8 & \\ & & 24 & 28 & 8 & \\ \hline & 6 & 7 & 2 & 0 & \end{array}$$

Convert the coefficients in the quotient back into polynomial form. Remember to reduce the exponent on the leading term by 1.

$$(6x^3 - 17x^2 - 26x - 8) \div (x - 4) = 6x^2 + 7x + 2$$

Exercise 4: Use synthetic division and the Remainder Theorem to find the indicated function value.

$$f(x) = -t^4 + 5t^2 + 4t - 20; f(3)$$

Add placeholders for any missing terms

$$f(x) = -t^4 + 5t^2 + 4t - 20$$

$$f(x) = -t^4 + 0t^3 + 5t^2 + 4t - 20$$

Setup the synthetic division

$$\begin{array}{r|rrrrrr} 3 & -1 & 0 & 5 & 4 & -20 & \\ & & -3 & -9 & -12 & -24 & \\ \hline & -1 & -3 & -4 & -8 & -44 & \end{array}$$

The last term in the bottom row is the remainder and the value of f(3)

$$f(3) = -44$$

Exercise 5: Solve for the other zeros given that 4 is a zero of $f(x) = x^3 - 17x + 4$.

Add placeholders for any missing terms

$$f(x) = x^3 + 0x^2 - 17x + 4$$

Use synthetic division with the given zero of 4

$$\begin{array}{r|rrrr} 4 & 1 & 0 & -17 & 4 \\ & & 4 & 16 & -4 \\ \hline & 1 & 4 & -1 & 0 \end{array}$$

Rewrite the zero and quotient in factored form

$$0 = (x - 4)(x^2 + 4x - 1)$$

Find the remaining zeros using the quadratic formula

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(4) \pm \sqrt{(4)^2 - 4(1)(-1)}}{2(1)} \\ &= \frac{-4 \pm \sqrt{16 + 4}}{2} \\ &= \frac{-4 \pm \sqrt{20}}{2} \\ &= \frac{-4 \pm 2\sqrt{5}}{2} \\ &= -2 \pm \sqrt{5} \end{aligned}$$