

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Learning Goal 3.2**

Factoring, including the factor theorem and the remainder theorem.

**More Questions - Solutions**

1. Use the Remainder Theorem to find the remainder of the following.

a.  $(6x^2 - 10x + 7) \div (3x + 1)$       b.  $\frac{-4x^3 - 9x + 10}{1 - 2x}$       c.  $11x - 4x^4 - 7$  by  $x - 3$

$x = -\frac{1}{3}$        $x = \frac{1}{2}$        $x = 3$

$$\begin{aligned} 6\left(-\frac{1}{3}\right)^2 - 10\left(-\frac{1}{3}\right) + 7 \\ = 6\left(\frac{1}{9}\right) + \frac{10}{3} + 7 \\ = \frac{6}{9} + \frac{30}{9} + \frac{63}{9} \\ = \frac{99}{9} \\ = 11 \end{aligned}$$

$$\begin{aligned} -4\left(\frac{1}{2}\right)^3 - 9\left(\frac{1}{2}\right) + 10 \\ = -4\left(\frac{1}{8}\right) - \frac{9}{2} + 10 \\ = -\frac{1}{2} - \frac{9}{2} + \frac{20}{2} \\ = \frac{10}{2} \\ = 5 \end{aligned}$$

$$\begin{aligned} 11(3) - 4(3)^4 - 7 \\ = 33 - 4(81) - 7 \\ = 33 - 324 - 7 \\ = -298 \end{aligned}$$

2. For each dividend, determine the value of  $k$  if the remainder is  $-2$ .

a.  $(2x^3 - 5x^2 - 4x + k) \div (x + 1)$       b.  $(x^3 - 4x^2 + kx + 10) \div (x - 3)$

$x = -1$        $x = 3$

$$\begin{aligned} 2(-1)^3 - 5(-1)^2 - 4(-1) + k &= -2 \\ 2(-1) - 5(1) - 4(-1) + k &= -2 \\ -2 - 5 + 4 + k &= -2 \\ -3 + k &= -2 \\ k &= 1 \end{aligned}$$

$$\begin{aligned} (3)^3 - 4(3)^2 + k(3) + 10 &= -2 \\ 27 - 4(9) + 3k + 10 &= -2 \\ 3k + 1 &= -2 \\ 3k &= -3 \\ k &= -1 \end{aligned}$$

3. For what value of  $m$  will the polynomial  $P(x) = x^3 + 6x^2 + mx - 4$  have the same remainder when it is divided by  $x - 1$  and  $x + 2$ ?

$x = 1$

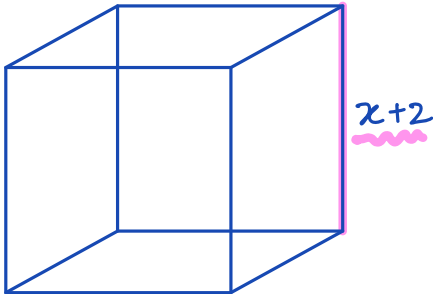
$x = -2$

$$\begin{aligned} P(1) &= (1)^3 + 6(1)^2 + m(1) - 4 \\ &= 1 + 6 + m - 4 \\ &= m + 3 \end{aligned}$$

$$\begin{aligned} P(-2) &= (-2)^3 + 6(-2)^2 + m(-2) - 4 \\ &= (-8) + 6(4) - 2m - 4 \\ &= 12 - 2m \end{aligned}$$

$$\begin{aligned} m + 3 &= 12 - 2m \\ 3m + 3 &= 12 \\ 3m &= 9 \\ m &= 3 \end{aligned}$$

4. You can model the volume, in cubic centimetres, of a rectangular box by the polynomial function  $V(x) = 3x^3 + x^2 - 12x - 4$ . Determine expressions for the other dimensions of the box if the height is  $x + 2$ .



$$\begin{array}{r|rrrr}
 -2 & 3 & 1 & -12 & -4 \\
 & \downarrow & \rightarrow & \rightarrow & \rightarrow \\
 & 3 & -5 & -2 & 0
 \end{array}$$

$$3x^2 - 5x - 2$$

$$\underline{-6} \times \underline{1} = \underline{-6}$$

$$\underline{-6} + \underline{1} = \underline{-5}$$

$$= 3x^2 - 6x + x - 2$$

$$= 3x(x-2) + (x-2)$$

$$= (x-2)(3x+1)$$

The other 2 dimensions are  $x-2$  cm and  $3x+1$  cm.