

3f)

$$\frac{2y^4 - 3y^2 + 1}{y - 3}$$

an 3.2

$$y-3 \overline{) 2y^4 + 0y^3 - 3y^2 + 0y + 1}$$

$$-(2y^4 - 6y^3)$$

$$0 + 6y^3 - 3y^2$$

$$-(6y^3 - 18y^2)$$

$$0 + 15y^2 + 0y$$

$$-(15y^2 - 45y)$$

$$0 + 45y + 1$$

$$-(45y - 135) \quad r \quad 136$$

$$1) (4x^3 - 8x^2 - 24x - 32) \div (2x - 8)$$

$$\begin{array}{r} 2x^2 + 4x + 4 \\ \hline 2x-8 \overline{) 4x^3 - 8x^2 - 24x - 32} \\ - (4x^3 - 16x^2) \quad \downarrow \\ \hline 0 + 8x^2 - 24x \\ - (8x^2 - 32x) \quad \downarrow \\ \hline 0 + 8x - 32 \\ - (8x - 32) \\ \hline 0 \quad 0 \\ \text{)} \end{array}$$

$$\frac{4x^3 - 8x^2 - 24x - 32}{2x - 8} = 2x^2 + 4x + 4$$

$$18) (18v^3 - 3v^2 - 42v - 6) \div (3v + 4)$$

$$\begin{array}{r} 6v^2 - 9v - 2 \\ \hline 3v+4 \overline{) 18v^3 - 3v^2 - 42v - 6} \\ \underline{-(18v^3 + 24v^2)} \\ 0 - 27v^2 - 42v \\ \underline{-(-27v^2 - 36v)} \\ 0 - 6v - 6 \\ \underline{-(-6v - 8)} \\ 0 + 2 \end{array}$$

$$\frac{18v^3 - 3v^2 - 42v - 6}{3v + 4} = 6v^2 - 9v - 2 + \frac{2}{3v + 4}$$

Chapter 3.2 Day 2

Synthetic division

- Synthetic division is a shorthand, or shortcut, method of polynomial division

This is NOT the method in the book
Do NOT use the method in the book

$$\frac{x^3 + x^2 - 10x + 8}{x - 1}$$

$x-1$ is a factor

$$x-1=0$$


$$x=1 \text{ is a root}$$

$$= x^2 + 2x - 8$$

- Write the polynomial in descending order, adding "zero terms" if an exponent term is skipped.
- Write the value of the root, and write all the coefficients of the polynomial in a horizontal line to the left of the root.
- Draw a line below the coefficients, leaving room above the line.
- Bring the first coefficient below the line.
- Multiply the number below the line by the root and write the result above the line below the next coefficient.
- Add the result from the coefficient above it.
- Repeat until all the coefficients have been used

Long division

$$\begin{array}{r} x^2 - 5x - 14 \\ x-2 \overline{) x^3 - 7x^2 - 4x + 28} \\ \underline{-(x^3 - 2x^2)} \downarrow \\ 0 - 5x^2 - 4x \\ \underline{-(-5x^2 + 10x)} \downarrow \\ 0 - 14x + 28 \\ \underline{-(-14x + 28)} \\ 0 \end{array}$$



Synthetic division

$x-2$ is factor

$$\begin{aligned} x-2 &= 0 \\ x &= 2 \end{aligned}$$

2		1	-7	-4	28
		↓	+ 2	+ 10	+ 28
<hr/>					
x		1	-5	-14	0

$$1x^2 - 5x - 14$$

Your Turn

Use synthetic division to determine $\frac{x^3 + 7x^2 - 3x + 4}{x - 2}$.

$$x - 2 = 0$$

$$x = 2$$

$$\begin{array}{r|rrrr} 2 & 1 & 7 & -3 & 4 \\ & \downarrow & +2 & +18 & +30 \\ \hline x & 1 & 9 & 15 & 34 \end{array}$$

$$\frac{x^3 + 7x^2 - 3x + 4}{x - 2} = x^2 + 9x + 15 + \frac{34}{x - 2}$$

4. Determine each quotient, Q , using synthetic division.

$$\text{a) } (x^3 + x^2 + 0x + 3) \div (x + 4) = x^2 - 3x + 12 - \frac{45}{x+4}$$

-4	1	1	0	3
	↓	+ 1	+ 0	+ 3
		-4	12	-48
x	1	-3	12	-45

- 10.** When $3x^2 + 6x - 10$ is divided by $x + k$, the remainder is 14. Determine the value(s) of k .

Extend

14. When the polynomial $mx^3 - 3x^2 + nx + 2$ is divided by $x + 3$, the remainder is -1 .

When it is divided by $x - 2$, the remainder is -4 . What are the values of m and n ?

remainder Theorem $P(a) = R$

$$\underline{P(-3) = -1}$$

$$-1 = m(-3)^3 - 3(-3)^2 + n(-3) + 2$$

$$-1 = -27m - 27 - 3n + 2$$

$$-1 = -27m - 3n - 25$$

$$24 = -27m - 3n$$

$$\boxed{8 = -9m - n}$$

$$P(2) = -4$$

$$-4 = m(2)^3 - 3(2)^2 + n(2) + 2$$

$$-4 = 8m - 12 + 2n + 2$$

$$-4 = 8m + 2n - 10$$

$$6 = 8m + 2n$$

$$\boxed{3 = 4m + n}$$

substitution or elimination

$$8 = -9m - n$$

$$3 = 4m + n$$

$$\begin{array}{r} 8 = -9m - n \\ + \quad 3 = 4m + n \\ \hline 11 = -5m + 0 \end{array}$$

$$\frac{-5m}{-5} = \frac{11}{-5}$$

$$m = -\frac{11}{5}$$

$$\begin{array}{l} \searrow \\ 3 = 4m + n \end{array}$$

$$n = 3 - 4m$$

$$n = 3 - 4\left(-\frac{11}{5}\right)$$

$$n = 3 + \frac{44}{5}$$

$$n = \frac{15}{5} + \frac{44}{5}$$

$$n = \frac{59}{5}$$

HW: pg 124 #4, 9-17
+ sheet