

Trig 4.3

Quiz 4.1-4.2 ~~Th~~ Wed.

Find the factors of polynomials

Use the remainder theorem

Use the factor theorem $R = 0$ if the factor

$$x^2 + 5x + 6$$
$$(x+3)(x+2)$$

$$\frac{6}{3 \times 2}$$

long division algorithm

$$\begin{array}{r} 15 \\ 18 \overline{) 270} \\ \underline{-18} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

synthetic division $15(?) = 270$

depressed polynomial

$$18(?) = 270$$

$$\begin{array}{r} 15 \\ \times 18 \\ \hline 120 \\ 15 \\ \hline 270 \end{array}$$

activity: whiteboards

Long division algorithm:

$$54/3$$

$$235/26$$

$$\begin{array}{r} 9 \frac{1}{26} \\ 26 \overline{) 235} \\ \underline{-234} \\ 1 \end{array}$$

$$\begin{array}{r} 26 \\ \times 9 \\ \hline 234 \\ 4 \\ \hline \end{array}$$

How do you check long division?

How do you know if something is a factor?

$$f(a) = 2a^2 + 3a - 8$$

$$f(\underline{2}) = \underline{6}$$

$$\begin{aligned} f(2) &= 2 \cdot 4 + 3 \cdot 2 - 8 \\ &= 8 + 6 - 8 \\ &= \textcircled{6} \end{aligned}$$

$$\begin{array}{r} 2a + 7 \\ \underline{a - 2} \overline{) 2a^2 + 3a - 8} \\ -2a^2 + 4a \\ \hline 7a - 8 \\ -7a + 14 \\ \hline 6 \end{array}$$

divide:

what does $x = ?$

$(x^3 + 4x^2 - 3x - 5)$ by $(x + 3)$ using synthetic division

$$\begin{array}{r|rrrr} -3 & 1 & 4 & -3 & -5 \\ & \downarrow & -3 & -3 & 18 \\ \hline & 1 & 1 & -6 & 13 \end{array}$$

$$x^2 + x - 6 \quad R13$$

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

Divide using synthetic division.

5. $(x^2 - x + 4) \div (x - 2)$

6. $(x^3 + x^2 - 17x + 15) \div (x + 5)$

$$\begin{array}{r|rrr} 2 & 1 & -1 & 4 \\ & \downarrow & 2 & 2 \\ \hline & 1 & 1 & 6 \end{array}$$

$x + 1 + \frac{6}{x-2}$

Long division algorithm
How do you know if it is a factor?

**Factor
Theorem**

The binomial $x - r$ is a factor of the polynomial $P(x)$ if and only if $P(r) = 0$.

2 Divide $x^3 - x^2 + 2$ by $x + 1$ using synthetic division.

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

$x^2 - 2x + 2$

Is $x+1$ a factor?

synthetic division OK except:

- 3 Use the Remainder Theorem to find the remainder when $2x^3 - 3x^2 + x$ is divided by $x - 1$. State whether the binomial is a factor of the polynomial. Explain.

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

$R=0$
yes

$\frac{1}{2}x^3 \cdot -4 - \frac{4}{2}x^3$ Watch out for missing terms (zero)
 $2x(?) = 2x^3$

Use the Remainder Theorem to find the remainder for each division. State whether the binomial is a factor of the polynomial.

7. $(x^2 + 2x - 15) \div (x - 3)$

8. $(x^4 + x^2 + 2) \div (2x - 3)$

$\frac{2}{2}x^4$

$\frac{1}{2}x^3 + x^2 + \frac{5}{2}x + 5 + \frac{2}{2x-4} + \frac{11}{x-2}$
 $2x-4 \overline{) x^4}$
 $-x^4 + 2x^3$
 $2x^3 + x^2$
 $-2x^3 + 4x^2$
 $5x^2 + 2$
 $-5x^2 + 10x$
 $10x + 2$
 $-10x + 20$
 22

$\frac{2x(?)}{2x} = \frac{5x^2}{2x}$

$\frac{2x(?)}{2x} = \frac{x^4}{2x}$

$\frac{5x}{7} \cdot \cancel{x}$

$-4 \cdot \frac{5}{2}x$

$$\begin{array}{r} 1 \overline{) 1 \quad -5 \quad -1 \quad 5} \\ \underline{1 \quad -4 \quad -5 \quad 0} \end{array}$$

$$\begin{array}{r} x^2 - 5x + 2 \\ \underline{-3 \quad 6 \quad -2} \\ -5 \end{array}$$

How many will there be?
remainder = 0
depressed polynomial
what to try?

Determine the binomial factors of each polynomial.

9. $x^3 - 5x^2 - x + 5$

$$\begin{array}{r} x^2 - 4x - 5 \\ \underline{-5 \quad 1} \\ -4 \end{array}$$

$$(x-1)(x-5)(x+1)$$

10. $x^3 - 6x^2 + 11x - 6$

$$\begin{array}{r} 1 \overline{) 1 \quad -6 \quad 11 \quad -6} \\ \underline{1 \quad -5 \quad 6 \quad 0} \end{array}$$

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

How is this problem different?

4 Determine the binomial factors of $x^3 - 7x + 6$.

[illegible]

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

$$K = ?$$

5 Find the value of k so that the remainder of $(x^3 + 3x^2 - kx - 24) \div (x + 3)$ is 0.

$k = ?$

$$\begin{array}{r|rrrr} -3 & 1 & 3 & -k & -24 \\ & \downarrow & -3 & 0 & (24) \\ \hline & 1 & 0 & -k & 0 \end{array} \quad \begin{array}{r|rrrr} -3 & 1 & 3 & -8 & -24 \\ & \downarrow & -3 & 0 & 24 \\ \hline & 1 & 0 & -8 & 0 \end{array}$$

$k = 8$

$$-k(-3) = 24$$

$$3k = 24$$

$$\text{'if } R \rightarrow \frac{3}{a-b}$$

p. 226
15-39 odd