Trig 4.3

Quiz 4.1-4.2 Thurs.

Find the factors of polynomials

Use the remainder theorem

Use the factor theorem

mult → subtr.

long division algorithm

synthetic division

depressed polynomial

$$\begin{array}{r} 15\frac{14}{23} \\ 23\overline{)459} \\ -23 \\ \hline 129 \\ -115 \\ \hline 14 \end{array}$$

activity: whiteboards

Long division algorithm:
54/3
235/26

$$\begin{array}{r} 18 \\ 3\overline{)54} \\ -3 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 18 \\ \times 3 \\ \hline 24 \\ 30 \\ \hline 54 \end{array}$$

How do you check long division?
How do you know if something is a factor?

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

$f(2) =$

$f(2) = 2 \cdot 2^2 + 3 \cdot 2 - 8$
$= 8 + 6 - 8$
$= 6$

★

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

$a - 2 = 0$
$a = 2$

$$\begin{array}{r|rrr} 2 & 2 & 3 & -8 \\ & \downarrow & 4 & 14 \\ \hline & 2 & 7 & 6 \end{array}$$

$2a + 7 + \frac{6}{a-2}$

divide:

$x+3=0$

what does x=?

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

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

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

Divide using synthetic division.

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

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

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

if R=0

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

0

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

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

$x^2 - 2x + 2$

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.

Coeff $\neq 1$

Watch out for missing terms (zero)

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

$(\quad)\cdot(\quad)\cdot(\quad)\cdot(\quad)$

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

$\pm 1 \quad \pm 5$

Determine the binomial factors of each polynomial.

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

$$\begin{array}{r|rrrr} 5 & 1 & -5 & -1 & 5 \\ & \downarrow & 5 & 0 & -5 \\ \hline & 1 & 0 & -1 & 0 \end{array}$$

$x = 5$
$-5 \quad -5$
$x - 5 = 0$

$x^2 - 1$

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

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

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

± 1
± 2
± 3
± 6

$$\begin{array}{r|rrrr} 2 & 1 & -6 & 11 & -6 \\ & \downarrow & 2 & -8 & 6 \\ \hline & 1 & -4 & 3 & 0 \end{array}$$

$x = 2$
$x - 2 = 0$

$x^2 - 4x + 3$

$3 \quad -1 \quad -3 \quad -4$

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

± 1 ± 2 ± 3 ± 6

How is this problem different?

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

$$\begin{array}{r|rrrr} 1 & 1 & 0 & -7 & 6 \\ & \downarrow & 1 & 1 & -6 \\ \hline & 1 & 1 & -6 & 0 \end{array}$$

$x^2 + x - 6$

-6

3 -2

1

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

~~$x=1$ $x=-3$ $x=2$~~

5 Find the value of k so that the remainder of $(x^3 + 3x^2 - \overset{8}{k}x - 24) \div (x + 3)$ is 0.

k=?

-3	1	3	-k	-24
	↓	-3	0	24
	1	0	(-k+0)	0

-3	1	3	-8	-24
	↓	-3	0	24
	1	0	-8	0

$(-k+0)(-3) = 24$

$3k = 24$

$k = 8$

4.3 5-37 odd