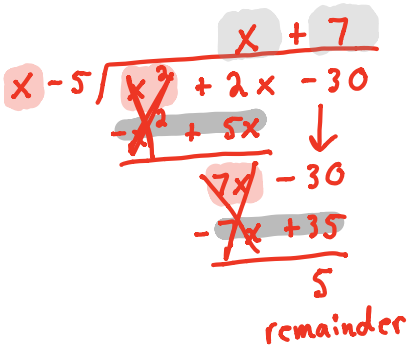
Math 3 Name: Key

Unit 3 Day 5 Notes – Polynomial Division Date:

Long Division:

Examples:

1. Divide $x^2 + 2x - 30$ by $x - 5$



$x + 7 + \frac{5}{x-5}$

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

$= x^2 - 5x$

change the signs

$= -x^2 + 5x$

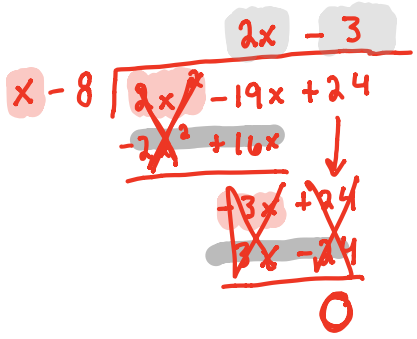
$\frac{7x}{x} = 7(x-5)$

$= 7x - 35$

change signs

$= -7x + 35$

2. Divide $2x^2 - 19x + 24$ by $x - 8$



$2x - 3$

$\frac{2x^2}{x} = 2x(x-8)$

$= 2x^2 - 16x$

Change signs

$= -2x^2 + 16x$

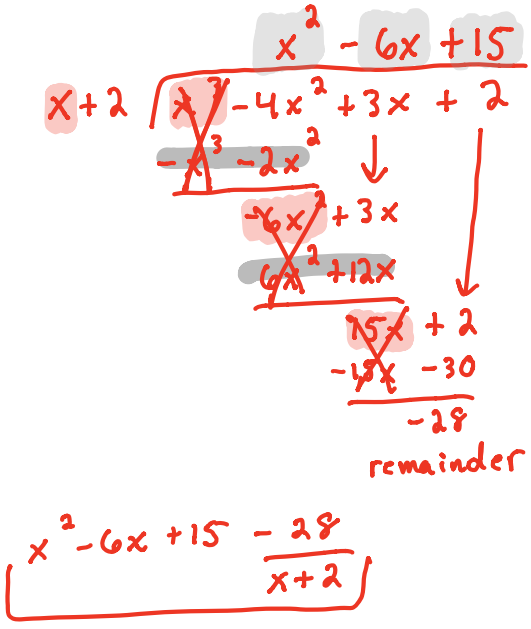
$\frac{-3x}{x} = -3(x-8)$

$= -3x + 24$

change signs

$= 3x - 24$

3. Divide $x^3 - 4x^2 + 3x + 2$ by $x + 2$



$x^2 - 6x + 15 - \frac{28}{x+2}$

$\frac{x^3}{x} = x^2(x+2)$

$= x^3 + 2x^2$

$= -x^3 - 2x^2$

$\frac{-6x^2}{x} = -6x(x+2)$

$= -6x^2 - 12x$

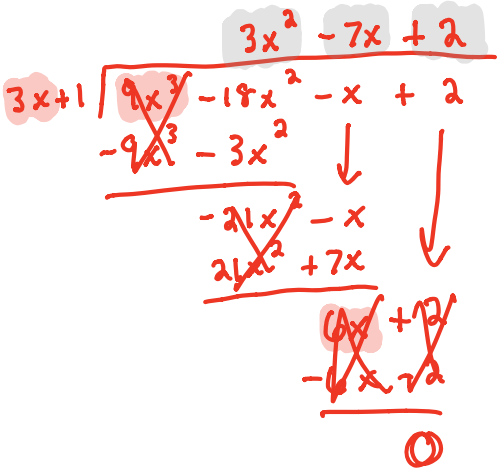
$= 6x^2 + 12x$

$\frac{15x}{x} = 15(x+2)$

$= 15x + 30$

$= -15x - 30$

4. Divide $9x^3 - 18x^2 - x + 2$ by $3x + 1$



$3x^2 - 7x + 2$

$\frac{9x^3}{3x} = 3x^2(3x+1)$

$= 9x^3 + 3x^2$

$= -9x^3 - 3x^2$

$\frac{-21x^2}{3x} = -7x(3x+1)$

$= -21x^2 - 7x$

$= 21x^2 + 7x$

$\frac{6x}{3x} = 2(3x+1)$

$= 6x + 2$

$= -6x - 2$

*when missing terms, replace with zeros!

5. Divide $x^3 + 27$ by $x + 3$

$(x^3 + 0x^2 + 0x + 27) \div (x+3)$

$x^2 - 3x + 9$

$x+3 \;|\; x^3 + 0x^2 + 0x + 27$

$-x^3 - 3x^2$

$-3x^2 + 0x$

$3x^2 + 9x$

$9x + 27$

$-9x - 27$

0

$x^2 - 3x + 9$

$\frac{x^3}{x} = x^2(x+3)$

$= x^3 + 3x^2$

$= -x^3 - 3x^2$

$\frac{-3x^2}{x} = -3x(x+3)$

$= -3x^2 - 9x$

$= 3x^2 + 9x$

$\frac{9x}{x} = 9(x+3)$

$= 9x + 27$

$= -9x - 27$

<u>Remainder & Factor Theorem:</u>

How to check whether a polynomial is a factor WITHOUT division:

6. Is $x + 1$ a factor of $x^3 + 4x^2 + x - 6$?

change sign

$x = -1$

$P(-1) = -4$

$x+1$ is NOT a factor

① STO → Button on Calc.

② Table on the calc. (y=)

*Remainder has to be zero to be a factor

7. Is $x - 3$ a factor of $x^3 - 4x^2 + x + 6$?

$x = 3$

$P(3) = 0$

$x-3$ IS a factor

How to use division to factor completely:

8. One factor of $2x^3 + 5x^2 - 22x + 15$ is $x - 1$.