8.) $(10x^2 - 9x + 5) \div (2x - 1)$

$$
\begin{array}{r}
5x - 2 + \dfrac{3}{2x-1} \\
2x-1 \overline{\smash{\big)}\,10x^2 - 9x + 5} \\
-(10x^2 - 5x) \\
\hline
-4x + 5 \\
-(-4x + 2) \\
\hline
3
\end{array}
$$

$\div$

$\times$

$-$

6.) $(x^4+3x^3-4x-11)\div(x+3)$

$$
\begin{array}{r|rrrrr}
-3 & 1 & 3 & 0 & -4 & -11 \\
 & \downarrow & -3 & 0 & 0 & 12 \\
\hline
 & 1 & 0 & 0 & -4 & 1
\end{array}
$$

$1x^3-4+\frac{1}{x+3}$

10.)

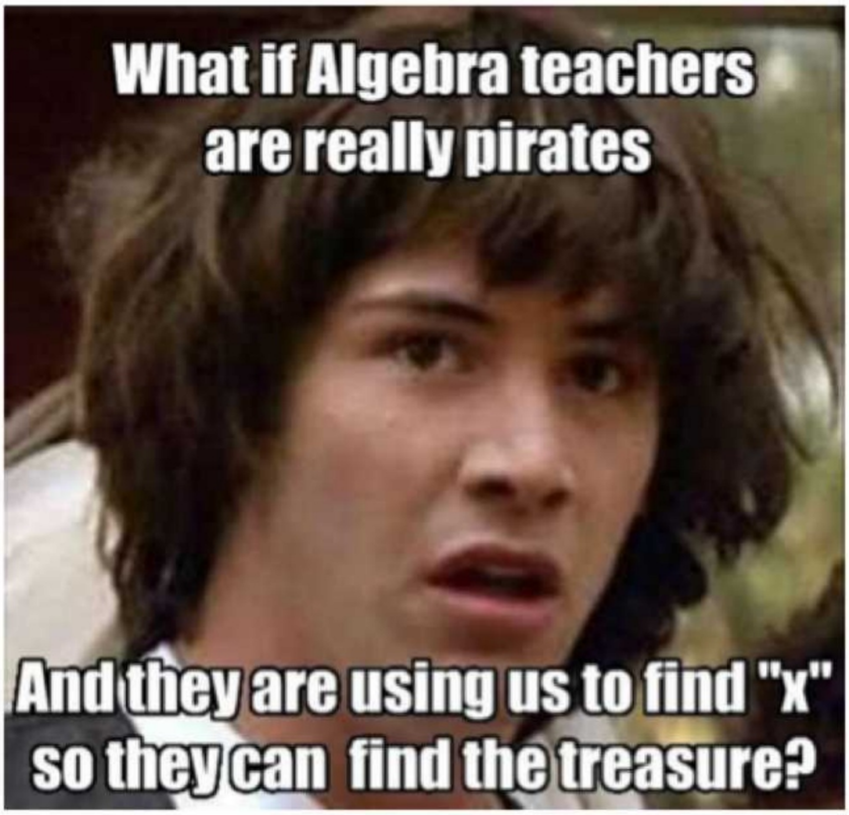
$$
\begin{array}{r}
k^2 + \dfrac{8}{2k+7} \\
2k+7 \enclose{longdiv}{2k^3+7k^2+0k+8} \\
-(2k^3+7k^2) \qquad \\
\hline
0+0k \qquad \\
-(0+0) \qquad \\
\hline
8
\end{array}
$$

$$
\begin{array}{r}
15\tfrac{2}{3} \\
3 \enclose{longdiv}{47} \\
3 \\
\hline
17 \\
15 \\
\hline
2
\end{array}
$$

9.) $(3a^3 - 8a^2 + 6a - 26) \div (a - 3)$

$$\begin{array}{r} 3a^2 + a + 9 + \frac{1}{a-3} \\ a-3 \overline{)\, 3a^3 - 8a^2 + 6a - 26} \\ -(3a^3 - 9a^2) \\ \hline a^2 + 6a \\ -(a^2 - 3a) \\ \hline 9a - 26 \\ -(9a - 27) \\ \hline 1 \end{array}$$

A2 - Solving Polynomial Equations by Factoring



Evaluating Polynomials

There are two ways to evaluate polynomial functions:

1. direct substitution

2. synthetic substitution

Direct Substitution (i.e. "PLUG IN")

ex: Find the indicated polynomial value using direct substitution.

a) $f(x) = x^2 - 5x + 2, \quad f(13) = ?$

$f(13) = 13^2 - 5(13) + 2$

$= 169 - 65 + 2$

$= 169 - 63 = 106$

$f(13) = 106$

Synthetic Substitution - substitution using a chart of coefficients

> *Before using synthetic substitution,
> - the polynomial must be in standard form
> - consider if all terms are present

ex: Find the indicated value using synthetic substitution.

a) $f(x) = x^2 - 5x + 2, \quad f(13) = ?$ 106

$$\begin{array}{r|rrr} 13 & 1 & -5 & 2 \\ & & 13 & 104 \\ \hline & 1 & 8 & 106 \end{array}$$

ex: Find the indicated value using synthetic substitution.

b) $g(x) = x^3 + 4x^2 - 1, \quad g(6) = ?$

$$\begin{array}{r|rrrr} 6 & 1 & 4 & 0 & -1 \\ & & 6 & 60 & 360 \\ \hline & 1 & 10 & 60 & 359 \end{array}$$

ex: Find the indicated value using synthetic substitution.

c) $m(x) = 5x^4 + 2x$ $\quad m(-2) = ?$ 76

$$\begin{array}{r|rrrrr} -2 & 5 & 0 & 0 & 2 & 0 \\ & & -10 & 20 & -40 & 76 \\ \hline & 5 & -10 & 20 & -38 & 76 \end{array}$$

Theorem:

A polynomial equation with degree n has __n__ solutions.

Vocabulary:

solutions/roots - answers to an equation

zeros - quantities that make a function equal to zero ex: Solve by factoring. → solutions - values of x.

a) $x^2 - 8x + 15 = 0$

$(x-5)(x-3) = 0$

$x-5=0 \quad x-3=0$

$\boxed{5,\ 3}$

ex: Solve by factoring.

b) $2x^4 + 7x^2 - 15 = 0$

$(2x^2 - 3)(x^2 + 5) = 0$

$2x^2 - 3 = 0$

$\sqrt{x^2} = \sqrt{\frac{3}{2}}$

$x = \pm\sqrt{\frac{3}{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$x = \pm\frac{\sqrt{6}}{2}$

$x^2 + 5 = 0$

$\sqrt{x^2} = \sqrt{-5}$

$x = \pm i\sqrt{5}$

ex: Solve by factoring.

c) $24x^4 + 3x = 0$

ex: Solve by factoring.

d) $\underbrace{x^3 - 5x^2}\ \underbrace{-9x + 45} = 0$

$x^2(x-5) - 9(x-5) = 0$

$(x^2-9)(x-5) = 0$

$(x+3)(x-3)(x-5) = 0$

$\boxed{-3,\ 3,\ 5}$

ex: Solve by factoring.

e) $x^4+2x^2+1=0$

$(x^2+1)(x^2+1)=0$

or $(x^2+1)^2=0$

$x^2+1=0$

$\sqrt{x^2}=\sqrt{-1}$

$x=\pm i$

multiplicity of 2

$x=\pm i$

ex: Solve by factoring.

f) $x^7 - 64x^5 = 0$

$x^5(x^2 - 64) = 0$

$x^5(x-8)(x+8) = 0$

$x^5 = 0 \quad x-8 = 0 \quad x+8 = 0$

$x = 0 \quad x = 8 \quad x = -8$

mult. of 5

Solve.

$$x^2(x-5)^3(3x-1)^4=0$$

$x^2=0$

$x=0$

mult of 2

$x-5=0$

$x=5$

mult. of 3

$3x-1=0$

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

mult. of 4