Mr. Ward Answer Key

Dividing Polynomials

Now this can seem very difficult at first but it's honestly no different then regular long division that you did in elementary school.

To illustrate this lets just do a simple problem you would have done in the 4th grade.

$$\begin{array}{r} 23 \\ 12\overline{)278} \\ 24 \\ 38 \\ 36 \\ 2 \end{array}$$

Go ahead and solve this out. Shouldn't take you too long. ☺

23 R 2

When you're done take a close look at the steps you performed. Also notice that you had a remainder. These are all things that are going to come up with polynomials.

Another thing you should be capable of doing is division by monomials. This is what that looks like:

$$\frac{12x^4y^2}{3x} = \frac{12 \cdot \cancel{x} \cdot x \cdot x \cdot x \cdot y \cdot y}{3 \cdot \cancel{x}} = 4x^3y^2$$

Let's move on to an actual example involving division of a polynomial by a binomial.

Example #1 $\quad x+2\overline{)2x^2+7x+7}$

$$\begin{array}{r} 2x + 3 \\ x+2\overline{)2x^2+7x+7} \\ -(2x^2+4x) \\ \hline 3x+7 \\ -(3x+6) \\ \hline 1 \end{array}$$

Follow out your series of steps just like you did above. First question you should be asking is *"how many times can x go into 2x²"*? Or another way to think of it is *"what times x is 2x²"*? If it's not coming to mind, set up the problem separately. Like this:

$$\frac{2x^2}{x} = \frac{2 \cdot \cancel{x} \cdot x}{\cancel{x}} = 2x$$

You should come up with 2x. Now put 2x up on top of the bar. Now multiply 2x and (x+2) and write your answer below the $2x^2 + 7x + 7$.

Continue out the steps until you have your solution. Then it's crucial that you check your answer against mine before moving on. If you got it wrong raise your hand and ask for help!

Answer $= 2x + 3$ remainder 1

$= 2x + 3 + \frac{1}{x+2}$

Example #2 $(4x^2 + 3x^3 + 10) \div (x - 2)$

First thing you need to do is write the first polynomial in standard form. The tricky thing here is that you need to do this by including terms that have a coefficient of 0. Or in other words by including terms that technically aren't even there!

So in this problem there is no x term. It has a coefficient of zero. So when we go to write out the first polynomial in standard form it will look like this:

$3x^3 + 4x^2 + 0x + 10$

Now you'll divide just like we did the first example.

Complete the problem and show all work. Then check your answer against my key to see if you did it correctly!

$$
\begin{array}{r}
3x^2 + 10x + 20 \\
x-2\overline{)\,3x^3 + 4x^2 + 0x + 10} \\
-(3x^3 - 6x^2) \\
\hline
10x^2 + 0x \\
-(10x^2 - 20x) \\
\hline
20x + 10 \\
-(20x - 40) \\
\hline
50
\end{array}
$$

$= 3x^2 + 10x + 20$ remainder 50

$= 3x^2 + 10x + 20 + \frac{50}{x-2}$

Assignment: pg 426 #2-4 (all), 13-18 (all), 39-47 (odds)

Mr. Ward

Answer Key

pg 426

2. $\boxed{5x - 2}$

$4x - 1 \overline{)\, 20x^2 - 13x + 2}$

$-(20x^2 - 5x)$

$-8x + 2$

$-8x + 2$

0

3. $x + 2$

$x - 1 \overline{)\, x^2 + x - 1}$

$-(x^2 - x)$

$2x - 1$

$-(2x - 2)$

1

$\boxed{= x + 2 + \frac{1}{x-1}}$

4. $x - 7$

$x + 5 \overline{)\, x^2 - 2x + 3}$

$-(x^2 + 5x)$

$-7x + 3$

$-(-7x - 35)$

38

$\boxed{= x - 7 + \frac{38}{x+5}}$

13. $\boxed{x + 4}$

$2x + 2 \overline{)\, 2x^2 + 10x + 8}$

$-(2x^2 + 2x)$

$8x + 8$

$8x + 8$

0

14. $\boxed{3x - 6}$

$3x \overline{)\, 9x^2 - 18x}$

$-(9x^2)$

$-18x$

$-18x$

0

15. $\boxed{x^2 - 1}$

$x + 2 \overline{)\, x^3 + 2x^2 - x - 2}$

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

$0 - x - 2$

$-(-x - 2)$

0

16. $x^3 + x^2 + 4x + 9$

$x - 4 \overline{)\, x^4 - 3x^3 + 0x^2 - 7x - 14}$

$-(x^4 - 4x^3)$

$x^3 + 0x^2$

$-(x^3 - 4x^2)$

$4x^2 - 7x$

$-(4x^2 - 16x)$

$9x - 14$

$-(9x - 36)$

22

$\boxed{= x^3 + x^2 + 4x + 9 + \frac{22}{x-4}}$

17. $\boxed{\frac{1}{2}x^3 - 2x^2 - \frac{7}{2}}$

$2x^3 \overline{)\, x^6 - 4x^5 + 0x^4 - 7x^3}$

$-(x^6)$

$-4x^5$

$-(-4x^5)$

$0x^4 - 7x^3$

$-(-7x^3)$

0

$\Rightarrow$

18. $3x-5 \,\big)\, 6x^2 - 7x - 5$ $\quad \boxed{2x+1}$

$-(6x^2 - 10x)$

$3x - 5$

$-(3x - 5)$

0

39. $y^2+4 \,\big)\, y^4 + 0y^3 + 9y^2 + 0x + 20$ $\quad \boxed{y^2+5}$

$-(y^4 + 4y^2)$

$5y^2 + 0x + 20$

$-(5y^2 + 20)$

0

41. $3x+4 \,\big)\, 3x^3 - 11x^2 - 56x - 48$ $\quad \boxed{x^2 - 5x - 12}$

$-(3x^3 + 4x^2)$

$-15x^2 - 56x$

$-(-15x^2 - 20x)$

$-36x - 48$

$-36x - 48$

0

43. $t^2 - 3t \,\big)\, t^3 - 7t^2 + 12t$ $\quad \boxed{t-4}$

$-(t^3 - 3t^2)$

$-4t^2 + 12t$

$-(-4t^2 + 12t)$

0

45. $x-6 \,\big)\, x^4 - 3x^3 - 28x^2 + 59x + 6$ $\quad \boxed{x^3 + 3x^2 - 10x - 1}$

$-(x^4 - 6x^3)$

$3x^3 - 28x^2$

$-(3x^3 - 18x^2)$

$-10x^2 + 59x$

$-(-10x^2 + 60x)$

$-x + 6$

$-(-x + 6)$

0

47. $x-6 \,\big)\, x^4 - 7x^3 + 9x^2 - 22x + 25$ $\quad x^3 - x^2 + 3x - 4$

$-(x^4 - 6x^3)$

$-x^3 + 9x^2$

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

$3x^2 - 22x$

$-(3x^2 - 18x)$

$-4x + 25$

$-(-4x + 24)$

1

$$\boxed{= x^3 - x^2 + 3x - 4 + \frac{1}{x-6}}$$