

HW SOL 4.8

March 13, 2018 10:59 PM

Name: _____

Date: _____

Math 10 Honors Section 4.8 Long Division:

1. Divide and find the quotient. Write the division statement for each of the following:

<p>i) $\frac{x^2 - 3x + 5}{x - 2}$</p> $\begin{array}{r} x-1 \\ x-2 \overline{) x^2 - 3x + 5} \\ \underline{x^2 - 2x} \\ -x + 5 \\ \underline{-x + 2} \\ 3 \end{array}$	<p>ii) $\frac{x^3 - 5x^2 + 10x - 15}{x - 3}$</p> $\begin{array}{r} x^2 - 2x + 4 \\ x-3 \overline{) x^3 - 5x^2 + 10x - 15} \\ \underline{x^3 - 3x^2} \\ -2x^2 + 10x - 15 \\ \underline{-2x^2 + 6x} \\ 4x - 15 \\ \underline{4x - 12} \\ -3 \end{array}$	<p>iii) $\frac{x^3 + 13x^2 + 39x + 20}{x + 9}$</p> $\begin{array}{r} x^2 + 4x + 3 \\ x+9 \overline{) x^3 + 13x^2 + 39x + 20} \\ \underline{x^3 + 9x^2} \\ 4x^2 + 39x + 20 \\ \underline{4x^2 + 36x} \\ 3x + 20 \\ \underline{3x + 27} \\ -7 \end{array}$
<p>iv) $\frac{x^3 - 12x - 20}{x + 2}$</p> $\begin{array}{r} x^2 - 2x - 8 \\ x+2 \overline{) x^3 - 12x - 20} \\ \underline{x^3 + 2x^2} \\ -2x^2 - 12x - 20 \\ \underline{-2x^2 - 4x} \\ -8x - 20 \\ \underline{-8x - 16} \\ -4 \end{array}$	<p>v) $\frac{x^4 + x^2 - 3x - 1}{2x + 1}$</p> <p>$2x+1=0 \Rightarrow x = -\frac{1}{2}$</p> $\begin{array}{r} \frac{1}{2}x^3 + \frac{1}{4}x^2 + \frac{5}{8}x + \frac{-29}{16} \\ \frac{1}{2}x^4 + \frac{1}{2}x^2 - 3x - 1 \\ \underline{\frac{1}{2}x^3 + \frac{1}{4}x^2 + \frac{5}{8}x + \frac{-29}{16}} \\ \frac{1}{16}x^2 + \frac{1}{4}x + \frac{24}{16} - \frac{16}{16} = \frac{13}{16} \end{array}$ <p>$(-\frac{1}{2})^4 + (\frac{1}{2})^2 - 3(-\frac{1}{2}) - 1 = \frac{1}{16} + \frac{1}{4} + \frac{3}{2} - 1 = \frac{1}{16} + \frac{4}{16} + \frac{24}{16} - \frac{16}{16} = \frac{13}{16}$</p>	<p>vi) $\frac{2x^3 - 13x + 5x^2 - 28}{x + 3}$</p> $\begin{array}{r} 2x^2 - x - 10 \\ x+3 \overline{) 2x^3 - 13x + 5x^2 - 28} \\ \underline{2x^3 + 6x^2} \\ -x^2 - 13x - 28 \\ \underline{-x^2 - 3x} \\ -10x - 28 \\ \underline{-10x - 30} \\ 2 \end{array}$
<p>vii) $\frac{32x^3 - 18x + 16x^2 + 9}{2x^2 + 1}$</p> $\begin{array}{r} 16x + 8 \\ 2x^2 + 1 \overline{) 32x^3 - 18x + 16x^2 + 9} \\ \underline{-(32x^3 + 16x)} \\ 16x^2 - 34x + 9 \\ \underline{-(16x^2 + 8)} \\ -34x + 1 \end{array}$ <p>Q: $16x + 8$ R: $-34x + 1$</p>	<p>viii) $\frac{-2x^3 + 4x^2 - 3x + 5}{4x^2 + 5}$</p> $\begin{array}{r} -\frac{1}{2}x + 1 \\ 4x^2 + 5 \overline{) -2x^3 + 4x^2 - 3x + 5} \\ \underline{-2x^3 + 5x} \\ 4x^2 + \frac{3}{2}x + 5 \\ \underline{4x^2 + 5} \\ \frac{3}{2}x \end{array}$	<p>ix) $\frac{2x^3 + 8x^4 - 3x^2 + 1 + 7x}{4x + 1}$</p> $\begin{array}{r} 8x^3 - \frac{3}{4}x + \frac{31}{16} \\ 4x+1 \overline{) 8x^4 + 2x^3 - 3x^2 + 7x + 1} \\ \underline{8x^4 + 2x^3} \\ -3x^2 + 7x + 1 \\ \underline{-3x^2 - \frac{3}{4}x} \\ \frac{31}{4}x + 1 \\ \underline{\frac{31}{4}x + \frac{31}{16}} \\ -\frac{15}{16} \end{array}$

$\frac{x^4-1}{x-1}$ $\frac{(x^2-1)(x^2+1)}{(x-1)}$ $\frac{(x+1)\cancel{(x-1)}(x^2+1)}{\cancel{(x-1)}}$ $= (x+1)(x^2+1)$	$\frac{9x^2-5}{3x+2}$ $\begin{array}{r} 3x+2 \overline{) 9x^2-5} \\ \underline{9x^2} \\ -6x \\ + \\ \underline{ 8x-5} \\ +4 \\ -9 \end{array}$
$\frac{x^4+x^3+x^2+x+1}{x+1}$ $\begin{array}{r} x+1 \overline{) x^4+x^3+x^2+x+1} \\ \underline{x^4+x^3} \\ x^2+x+1 \\ \underline{ x^2+x} \\ 1 \end{array}$	<p>Divide: $8x^3-6x^2+2x-5$ by $4x^2-x-1$</p> $\begin{array}{r} 2x-1 \overline{) 8x^3-6x^2+2x-5} \\ \underline{8x^3-2x^2-2x} \\ 4x^2+4x-5 \\ \underline{-(4x^2-x-1)} \\ 3x-6 \end{array}$ <p>$8x^3-6x^2+2x-5 = (4x^2-x-1)(2x-1) + 3x-6$</p>
<p>Divide: $3x^4-6x^3+9x^2-5x+8$ by x^2+x-3</p> $\begin{array}{r} 3x^2-9x+27 \overline{) 3x^4-6x^3+9x^2-5x+8} \\ \underline{3x^4+3x^3-9x^2} \\ -9x^3+18x^2-5x+8 \\ \underline{-9x^3-9x^2+27x} \\ 27x^2-32x+8 \\ \underline{27x^2+27x-81} \\ -59x+89 \end{array}$	<p>Divide: $10x^4+8x^3-9x^2+7x-3$ by x^2+x-3</p> $\begin{array}{r} 10x^2-2x+23 \overline{) 10x^4+8x^3-9x^2+7x-3} \\ \underline{10x^4+10x^3-30x^2} \\ -2x^3+21x^2+7x-3 \\ \underline{-2x^3-2x^2-6x} \\ 23x^2+13x-3 \\ \underline{-23x^2+23x-69} \\ -10x+66 \end{array}$

2. Determine the value of "k" such that when $2x^3+9x^2+kx-15$ is divided by $x+5$, the remainder is 0.

$$\begin{array}{r} 2x^2-x+(k-5) \overline{) 2x^3+9x^2+kx-15} \\ \underline{2x^3+10x^2} \\ -x^2+kx-15 \\ \underline{-x^2+5x} \\ (k-5)x-15 \\ \underline{(k-5)x+(k-5)5} \\ -15-5k+25 \end{array}$$

$$R = -15 - 5k + 25$$

$$10 - 5k = 0$$

$$k = 2$$

3. When $2x^2+x-7$ is divided by $ax+b$, the quotient is $2x+5$ and the remainder is 3. What are the values of "a" and "b"?

$$(ax+b)(2x+5) + 3 = 2x^2+x-7$$

3. When $2x^2 + x - 7$ is divided by $ax + b$, the quotient is $2x + 5$ and the remainder is 3. What are the values of "a" and "b"?

$$\begin{aligned} (2x+5)(ax+b) + 3 &= 2x^2 + x - 7 \\ 2ax^2 + 5ax + 2bx + 5b + 3 &= 2x^2 + x - 7 \\ 2ax^2 + (5a+2b)x + (5b+3) &= 2x^2 + x - 7 \end{aligned}$$

$2a = 2$
 $a = 1$
 $5b + 3 = -7$
 $5b = -10$
 $b = -2$

4. If $ax^2 + bx + 1$ is divided by $2x - 3$, the remainder is 0. What is the value of $3a + 2b$?

$$\frac{ax^2 + bx + 1}{(2x - 3)} \Rightarrow \text{remainder } = 0$$

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

$$ax^2 + bx + 1 = (2x - 3)(mx - n)$$

$$\left\{ \begin{aligned} a\left(\frac{3}{2}\right)^2 + b\left(\frac{3}{2}\right) + 1 &= 0 \\ \frac{4}{3} \left[\frac{9a}{4} + \frac{3b}{2} \right] &= -1 \end{aligned} \right. \cdot \frac{4}{3}$$

$$3a + 2b = -\frac{4}{3}$$

5. Given the expression: $2x^3 - 3x^2 - 8x - 3$, which of the following will give a remainder of 0 when divided by it: $x + 1$, $x - 1$, or $x - 3$?

$$\begin{aligned} f(-1) &= 2(-1)^3 - 3(-1)^2 - 8(-1) - 3 \\ &= -2 - 3 + 8 - 3 = -8 + 8 = 0 \end{aligned}$$

$$\begin{aligned} f(1) &= 2(1)^3 - 3(1)^2 - 8(1) - 3 \\ &= 2 - 3 - 8 - 3 = -12 \neq 0 \end{aligned}$$

$$\begin{aligned} f(3) &= 2(3)^3 - 3(3)^2 - 8(3) - 3 \\ &= 54 - 27 - 24 - 3 = 0 \end{aligned}$$

Ans: $(x + 1)$ and $x - 3$

6. When $x^2 - 3x + k$ is divided by $x - k$, the remainder is "k". Find all the possible the value(s) of "k".

$$\frac{x^2 - 3x + k}{x - k} = \quad , \quad R = k$$

$x - k = 0$
 $x = k$

$$\left\{ \begin{aligned} x^2 - 3x + k &= \text{Remainder} \\ k^2 - 3k + k &= k \\ k^2 - 3k &= 0 \\ k(k - 3) &= 0 \\ k = 0, k = 3 \end{aligned} \right.$$

7. Divide and find the quotient for each of the following. Then factor the quotient.

8. Given that $x^3 - x^2 - 24x - 36 = (x+3)(x+A)(x+B)$. What are the values of "A" and "B"?

$$\begin{array}{r} -3 \overline{) 1 \quad -1 \quad -24 \quad -36} \\ \underline{1 \quad -3 \quad 12 \quad 36} \\ 1 \quad -4 \quad -12 \quad 0 \end{array}$$

$$x^2 - 4x - 12 = (x+A)(x+B)$$

$$(x-6)(x+2) = (x+A)(x+B)$$

$$(A, B) = (-6, 2) \text{ or } (2, -6)$$

9. Given that $6x^3 - 11x^2 - 4x + 4 = (x-2)(2x+A)(3x+B)$. What are the values of "A" and "B"?

↑
should be $x-2$

$$\begin{array}{lll} x-2=0 & 2x+A=0 & 3x+B=0 \\ x=2 & 2(2)+A=0 & 3(2)+B=0 \\ & \boxed{A=-4} & \boxed{B=-6} \end{array}$$

10. When the dividend $ax^3 + bx^2 + 4x - 8$ is divided by $x^2 - x - 2$, the remainder is $15x + 2$. Find the values of "a" and "b".

$$\begin{array}{l} ax^3 + bx^2 + 4x - 8 = (x^2 - x - 2)(\text{num}) + 15x + 2 \\ ax^3 + bx^2 - 11x - 10 = (x+1)(x-2)(\text{num}) \\ \left. \begin{array}{l} \frac{ax^3 + bx^2 - 11x - 10}{x+1} \Rightarrow R=0 \\ \frac{ax^3 + bx^2 - 11x - 10}{x-2} \Rightarrow R=0 \\ a(-1)^3 + b(-1)^2 - 11(-1) - 10 = 0 \\ a(2)^3 + b(2)^2 - 11(2) - 10 = 0 \end{array} \right\} \end{array}$$

11. When the dividend $ax^3 + bx^2 - 53x - 8$ is divided by $x^2 - 5x - 6$, the remainder is $48x - 86$. Find the values of "a" and "b".

$$\begin{array}{l} ax^3 + bx^2 - 53x - 8 = (x^2 - 5x - 6)(\text{num}) + 48x - 86 \\ ax^3 + bx^2 - 53x - 8 = (x-2)(x-3)(\text{num}) + 48x - 86 \\ ax^3 + bx^2 - 53x - 8 - 48x + 86 = (x-2)(x-3)(\text{num}) \\ ax^3 + bx^2 - 101x + 78 = (x-2)(x-3)(\text{num}) \\ \left. \begin{array}{l} \frac{ax^3 + bx^2 - 101x + 78}{(x-2)} \Rightarrow R=0 \\ \frac{ax^3 + bx^2 - 101x + 78}{(x-3)} \Rightarrow R=0 \\ a(2)^3 + b(2)^2 - 101(2) + 78 = 0 \\ 8a + 4b - 202 + 78 = 0 \\ 8a + 4b - 124 = 0 \\ 2a + b - 31 = 0 \\ a(3)^3 + b(3)^2 - 101(3) + 78 = 0 \\ 27a + 9b - 303 + 78 = 0 \\ 27a + 9b - 225 = 0 \\ 3a + b - 25 = 0 \end{array} \right\} \end{array}$$

$$\begin{array}{l} 3x [2a + b - 31 = 0 \\ 2x [3a + b - 25 = 0 \end{array}$$

$$\begin{array}{r} 6a + 3b - 93 = 0 \\ -6a + 2b - 50 = 0 \\ \hline b - 43 = 0 \end{array} \quad \boxed{b = 43}$$

$$\frac{-6a + 43}{b - 43} = 0 \quad \text{b} = 43$$

$$2a + 43 - 31 = 0$$

$$2a = 31 - 43$$

$$2a = -12$$

$$a = -6$$

$$ax^3 + bx^2 - 53x - 8 \div \underline{x^2 - 5x - 6} \Rightarrow R = 48x - 86$$

$$ax^3 + bx^2 - 53x - 8 = (x-6)(x+1)(?) + \underline{48x - 86}$$

$$\underline{ax^3 + bx^2 - 101x + 78} = (\underline{x-6})(\underline{x+1})(?) + \text{??}$$

$$x=6: a(6)^3 + b(6)^2 - 101(6) + 78 = 0 \quad x=-1: -a + b + 101 + 78 = 0$$

$$216a + 36b = 606 - 78$$

$$216a + 36b = 528$$

$$-a + b = -179$$