

# HW SOL 4.8

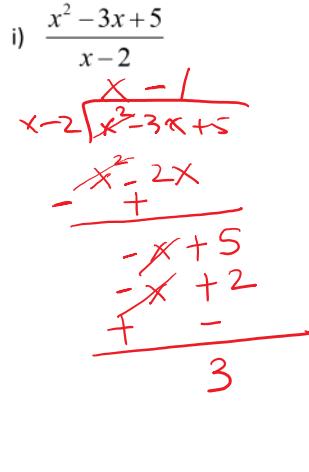
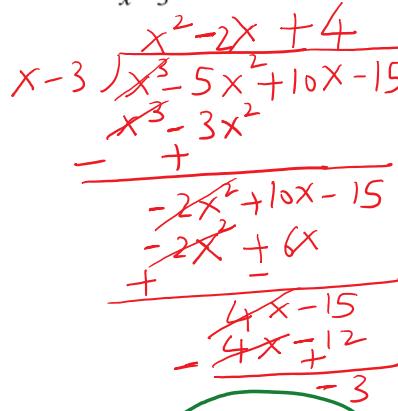
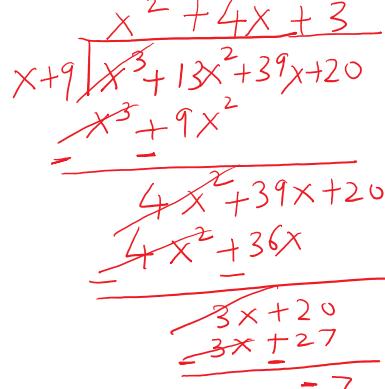
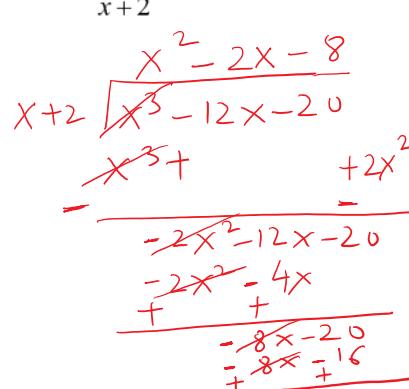
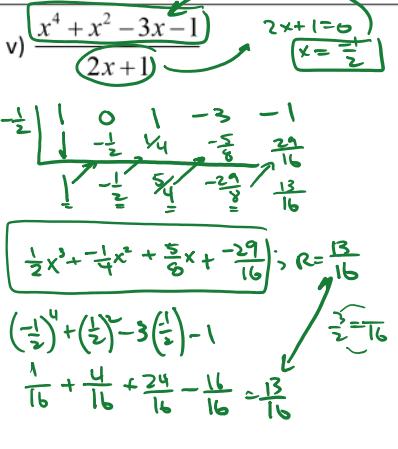
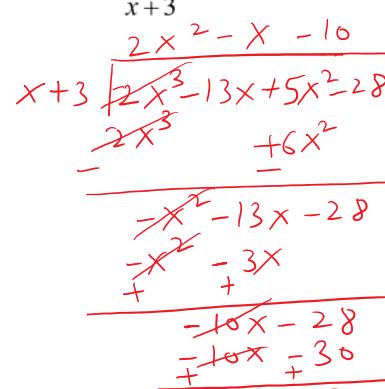
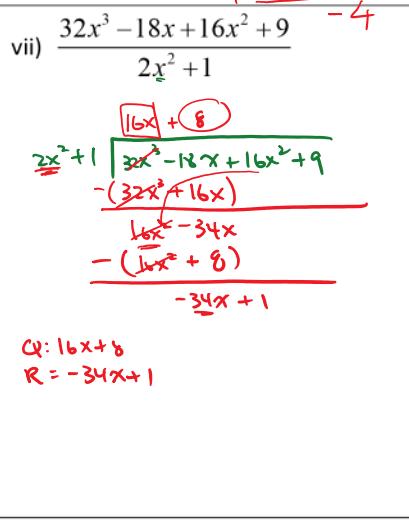
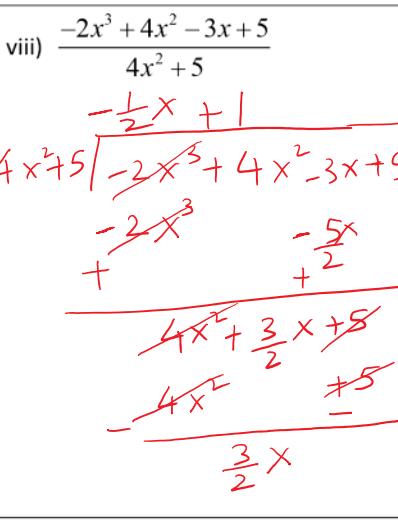
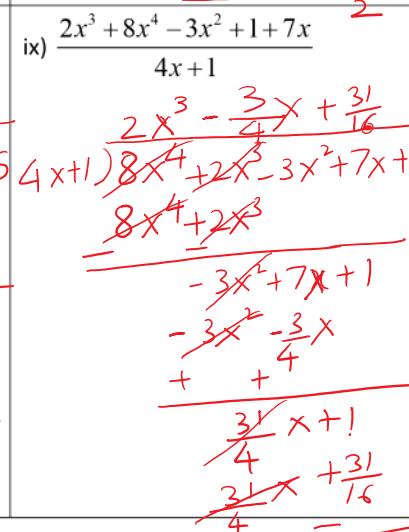
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## Math 10 Honors Section 4.8 Long Division:

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

$\text{i) } \frac{x^2 - 3x + 5}{x - 2}$ 	$\text{ii) } \frac{x^3 - 5x^2 + 10x - 15}{x - 3}$ 	$\text{iii) } \frac{x^3 + 13x^2 + 39x + 20}{x + 9}$ 
$\text{iv) } \frac{x^3 - 12x - 20}{x + 2}$ 	$\text{v) } \frac{x^4 + x^2 - 3x - 1}{2x + 1}$ 	$\text{vi) } \frac{2x^3 - 13x + 5x^2 - 28}{x + 3}$ 
$\text{vii) } \frac{32x^3 - 18x + 16x^2 + 9}{2x^2 + 1}$  <p>Q: <math>16x + 8</math> R: <math>-34x + 1</math></p>	$\text{viii) } \frac{-2x^3 + 4x^2 - 3x + 5}{4x^2 + 5}$ 	$\text{ix) } \frac{2x^3 + 8x^4 - 3x^2 + 1 + 7x}{4x + 1}$ 

$$\begin{aligned} & \frac{x^4 - 1}{x - 1} \\ & \cancel{(x^2 - 1)(x^2 + 1)} \\ & \cancel{(x + 1)(x - 1)(x^2 + 1)} \\ & = (x + 1)(x^2 + 1) \end{aligned}$$

$$\begin{array}{r} \underline{9x^2 - 5} \\ 3x + 2 \end{array}$$

$\overline{3x+2 \sqrt{9x^2 - 5}}$   
 $\cancel{9x^2} \quad -6x$   
 $- \quad \quad \quad +$   
 $\cancel{-6x} \quad 5$   
 $\cancel{-6x} \quad +4$   
 $- \quad \quad \quad -$   
 $-9$

$$\begin{array}{r} x^4 + x^3 + x^2 + x + 1 \\ \hline x + 1 \end{array} \quad \begin{array}{r} x^3 + x \\ \hline x^4 + x^3 + x^2 + x + 1 \\ - \\ \hline x^4 + x^3 \\ - \\ \hline x^2 + x + 1 \\ - \\ \hline x^2 + x \\ - \\ \hline \end{array}$$

$$\begin{array}{r}
 \text{Divide: } 8x^3 - 6x^2 + 2x - 5 \text{ by } 4x^2 - x - 1 \\
 \hline
 4x^2 - x - 1 \overline{)8x^3 - 6x^2 + 2x - 5} \\
 - (8x^4 - 2x^3 - 2x) \\
 \hline
 -4x^3 + 4x - 5 \\
 - (-4x^4 + x^3 + x + 1) \\
 \hline
 3x - 6
 \end{array}$$

$$8x^3 - 6x^2 + 2x - 5 = (4x^2 - x - 1)(2x - 1) + 3x - 6.$$

Divide:  $3x^4 - 6x^3 + 9x^2 - 5x + 8$  by  $x^2 + x - 3$

$$\begin{array}{r} \underline{3x^2 - 9x + 27} \\ x^2 + x - 3 ) \underline{\underline{3x^4 - 6x^3 + 9x^2 - 5x + 8}} \\ \underline{-3x^4 + 3x^3 - 9x^2} \\ \underline{\underline{-9x^3 + 18x^2 - 5x + 8}} \\ \underline{-9x^3 - 9x^2 + 27x} \\ \underline{\underline{27x^2 - 32x + 8}} \\ \underline{27x^2 + 27x - 81} \\ \underline{\underline{-59x + 89}} \end{array}$$

**Divide:**  $10x^4 + 8x^3 - 9x^2 + 7x - 3$  by  $x^2 + x - 3$

$$\begin{array}{r}
 \underline{10x^2 - 2x + 23} \\
 \underline{10x^4 + 8x^3 - 9x^2 + 7x - 3} \\
 - \underline{10x^4 + 10x^3 - 30x^2} \\
 \hline
 -2x^3 + 21x^2 + 7x - 3 \\
 - \underline{2x^3 - 2x^2 - 6x} \\
 \hline
 23x^2 + 13x - 3 \\
 - \underline{23x^2 + 23x - 69} \\
 \hline
 -10x + 66
 \end{array}$$

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

$$\begin{array}{r}
 \text{Find the value of } k \text{ such that when } 2x^3 + 9x^2 + kx - 15 \text{ is divided by } x+5, the remainder is } 0. \\
 \begin{array}{c}
 \underline{2x^2 - x + (k-5)} \\
 x+5 ) \underline{2x^3 + 9x^2 + kx - 15} \\
 \cancel{-} \cancel{2x^3} + 10x^2 \\
 \underline{\underline{-}} \quad \underline{\underline{-}} \\
 -x^2 + kx - 15 \\
 -x^2 + 5x \\
 \underline{\underline{+}} \quad \underline{\underline{-}} \\
 (k-5)x - 15 \\
 (k-5)x + (k-5)5 \\
 \underline{\underline{-}} \quad \underline{\underline{-}} \\
 -15 - 5k + 25
 \end{array}
 \end{array}$$

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

$$10 - 5K = 0$$

$K=2$

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"?

$$(2x+1)(-x+1) + 3 = -2x^2 + x - 7$$

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

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

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

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

$$\begin{aligned} 2a &= 2 \\ \textcircled{a=1} \end{aligned}$$

$$\begin{aligned} 5b+3 &= -7 \\ 5b &= -10 \\ \textcircled{b=-2} \end{aligned}$$

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

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

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

$$ax^2 + bx + 1 = (2x-\underline{\underline{3}})(mx-\underline{\underline{k}})$$

$$\left\{ \begin{array}{l} a\left(\frac{3}{2}\right)^2 + b\left(\frac{3}{2}\right) + 1 = 0 \\ \frac{4}{3} \left[ \frac{9a}{4} + \frac{3b}{2} \right] = -17 \cdot \frac{4}{3} \\ 3a + 2b = -\frac{4}{3} \end{array} \right.$$

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  $x-3$ ?

$$\begin{aligned} f(-1) &= 2(-1)^3 - 3(-1)^2 - 8(-1) - 3 \\ &= -2 - 3 + 8 - 3 = -8 + 8 = \boxed{0} \\ f(1) &= 2(1)^3 - 3(1)^2 - 8(1) - 3 \\ &= 2 - 3 - 8 - 3 = -12 \neq 0 \\ f(3) &= 2(3)^3 - 3(3)^2 - 8(3) - 3 \\ &= 54 - 27 - 24 - 3 = \boxed{0} \end{aligned}$$

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".

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

$$\begin{aligned} x-k &= 0 \\ \textcircled{x=k} \end{aligned}$$

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

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"?

$$\begin{array}{r} -3 \\ \hline 1 & -1 & -24 & -36 \\ 1 & -3 & 12 & 36 \\ \hline 1 & -4 & -12 & 0 \end{array}$$

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

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

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

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

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

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".

$$\begin{array}{l} ax^3 + bx^2 + 4x - 8 = (x^2 - x - 2)(\dots) + 15x + 2 \\ ax^3 + bx^2 - 11x - 10 = (x+1)(x-2)(\dots) \\ \frac{ax^3 + bx^2 - 11x - 10}{x+1} \Rightarrow R=0 \quad \left\{ \begin{array}{l} \frac{ax^3 + bx^2 - 11x - 10}{x-2} \Rightarrow R=0 \\ a(-1)^3 + b(-1)^2 - 11(-1) - 10 = 0 \end{array} \right. \\ a(-1)^3 + b(-1)^2 - 11(-1) - 10 = 0 \quad \left. \begin{array}{l} a(2)^3 + b(2)^2 - 11(2) - 10 = 0 \\ a(2)^3 + b(2)^2 - 22 - 10 = 0 \end{array} \right. \end{array} \right\}$$

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".

$$\begin{array}{l} ax^3 + bx^2 - 53x - 8 = (x^2 - 5x - 6)(\dots) + 48x - 86 \\ ax^3 + bx^2 - 53x - 8 = (x-2)(x-3)(\dots) + 48x - 86 \end{array}$$

$$\begin{array}{l} ax^3 + bx^2 - 53x - 8 - 48x + 86 = (x-2)(x-3)(\dots) \\ ax^3 + bx^2 - 101x + 78 = (x-2)(x-3)(\dots) \\ \frac{ax^3 + bx^2 - 101x + 78}{(x-2)} \Rightarrow R=0 \quad \left\{ \begin{array}{l} \frac{ax^3 + bx^2 - 101x + 78}{(x-3)} \Rightarrow R=0 \\ a(2)^3 + b(2)^2 - 101(2) + 78 = 0 \end{array} \right. \\ a(2)^3 + b(2)^2 - 101(2) + 78 = 0 \\ 8a + 4b - 202 + 78 = 0 \\ 8a + 4b - 124 = 0 \\ 2a + b - 31 = 0 \end{array} \right.$$

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

$$\begin{array}{r} 6a + 3b - 93 = 0 \\ -6a + 2b - 50 = 0 \\ \hline - \quad + \\ 1 - 43 = 0 \end{array} \quad \boxed{b = 43}$$

$$\begin{array}{r} -16a + 43 = 0 \\ \hline b - 43 = 0 \end{array} \quad b = 43$$

$$2a + 43 - 3b = 0$$

$$\begin{array}{l} 2a = 3b - 43 \\ 2a = -12 \end{array}$$

$$a = -6$$

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

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

$$ax^3 + bx^2 - 101x + 78 = (x-6)(x+1)(?) - 178$$

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

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

$$216a + 36b = 528$$

$$-a + b = -179$$