

Polynomials Functions

Name Key

Addition and Subtraction: Simplify the following

1. $(6x^3 - 3x^2 - 7x) - (8x^3 - x) - (5x^3 + 2x^2)$
 $6x^3 - 3x^2 - 7x - 8x^3 + x - 5x^3 - 2x^2$
 $-7x^3 - 5x^2 - 6x$

Multiplication: Find each product

3. $(2x + 3)^2$
 $(2x+3)(2x+3)$
 $4x^2 + 6x + 6x + 9$
 $4x^2 + 12x + 9$

5. $(3x + 7)(7x^2 - 5x + 6)$

	$7x^2$	$-5x$	6	
$3x$	$21x^3$	$-15x^2$	$18x$	$21x^3 + 34x^2 - 17x + 42$
7	$49x^2$	$-35x$	42	

2. $(3x^3 + 7 - x) - (10x^3 - 4x) + (7x + 5)$
 $3x^3 + 7 - x - 10x^3 + 4x + 7x + 5$
 $-7x^3 + 10x + 12$

4. $(2x - 1)(x + 3) + 3(x + 3)$
 $2x^2 + 6x - x - 3 + 3x + 9$
 $2x^2 + 8x + 6$

6. $(8 + 3x)(8 - 3x)$
 $64 - 24x + 24x - 9x^2$
 $-9x^2 + 64$

Solve the following polynomials by factoring

7. $x^4 + 3x^3 - 18x^2 = 0$
 $x^2(x^2 + 3x - 18) = 0$
 $x^2(x + 6)(x - 3) = 0$
 $x = 0 \quad x = -6 \quad x = 3$

8. $(x^3 + 5x^2)(-2x - 10) = 0$
 $x^2(x + 5) - 2(x + 5) = 0$
 $(x^2 - 2)(x + 5) = 0$
 $x = \pm\sqrt{2} \quad x = -5$

9. $\sqrt[3]{8x^3 + 27} = 0$
 $(2x + 3)(4x^2 - 6x + 9) = 0$
 $x = -\frac{3}{2}$ Not factorable

Dividing Polynomials by Polynomials Using Long Division

10. $(x^2 - 11x + 28) \div (x - 4)$
 $x - 4 \overline{) x^2 - 11x + 28}$
 $\ominus x^2 - 4x$
 $-7x + 28$
 $\ominus -7x + 28$
 $0 R$
 $x - 7$

11. $(x^3 - 27)(x - 3)^{-1} \rightarrow \frac{x^3 - 27}{x - 3}$
 $x - 3 \overline{) x^3 + 0x^2 + 0x - 27}$
 $\ominus x^3 - 3x^2$
 $3x^2 + 0x$
 $\ominus 3x^2 - 9x$
 $9x - 27$
 $\ominus 9x - 27$
 $x^2 + 3x + 9$

12. $(3x^3 - 17x^2 + 15x - 25) \div (x - 5)$

$$\begin{array}{r} 3x^2 - 2x + 5 \\ x-5 \overline{) 3x^3 - 17x^2 + 15x - 25} \\ \underline{\ominus 3x^3 - 15x^2} \\ -2x^2 + 15x \\ \underline{\ominus -2x^2 + 10x} \\ 5x - 25 \\ \underline{\ominus 5x - 25} \\ 0 \end{array}$$

Use synthetic division to divide

14. $(4x^3 - 9x + 8x^2 - 18) \div (x + 2)$

$$\begin{array}{r} -2 \overline{) 4 \quad 8 \quad -9 \quad -18} \\ \underline{\oplus -8 \quad 0 \quad 18} \\ 4 \quad 0 \quad -9 \quad 0 \\ x^2 \quad x \end{array}$$

$$4x^2 - 9$$

16. $(10x^4 - 50x^3 - 800) \div (x - 6)$ Root = 6

$$\begin{array}{r} 6 \overline{) 10 \quad -50 \quad 0 \quad 0 \quad -800} \\ \underline{\oplus 60 \quad 60 \quad 360 \quad 2160} \\ 10 \quad 10 \quad 60 \quad 360 \quad 0 \\ x^4 \quad x^3 \quad x^2 \quad x \end{array}$$

$$10x^3 + 10x^2 + 60x + 360 + \frac{1360}{x-6}$$

18. $(x^4 - 2x^3 + x - 1) \div (x + 1)$ Root = -1

$$\begin{array}{r} -1 \overline{) 1 \quad -2 \quad 0 \quad 1 \quad -1} \\ \underline{\oplus -1 \quad 3 \quad -3 \quad 2} \\ 1 \quad -3 \quad 3 \quad -2 \quad 0 \\ x^4 \quad x^3 \quad x^2 \quad x \end{array}$$

$$x^3 - 3x^2 + 3x - 2 + \frac{1}{x+1}$$

13. $(3x^3 + 4x + 11) \div (x^2 - 3x + 2)$

$$\begin{array}{r} 3x + 9 \\ x^2 - 3x + 2 \overline{) 3x^3 + 0x^2 + 4x + 11} \\ \underline{\ominus 3x^3 - 9x^2 + 6x} \\ 9x^2 - 2x + 11 \\ \underline{\ominus 9x^2 - 27x + 18} \\ 25x - 7 \end{array}$$

$$3x + 9 + \frac{25x - 7}{x^2 - 3x + 2}$$

15. $(-x^3 + 75x - 250) \div (x + 10)$ Root = -10

$$\begin{array}{r} -10 \overline{) -1 \quad 0 \quad 75 \quad -250} \\ \underline{\oplus 10 \quad -100 \quad 250} \\ -1 \quad 10 \quad -25 \quad 0 \\ x^3 \quad x^2 \end{array}$$

$$-x^2 + 10x - 25$$

17. $(x^4 - 4x^3 - 15x^2 + 58x - 40) \div (x - 5)$ Root = 5

$$\begin{array}{r} 5 \overline{) 1 \quad -4 \quad -15 \quad 58 \quad -40} \\ \underline{\oplus 5 \quad 5 \quad -50 \quad 40} \\ 1 \quad 1 \quad -10 \quad 8 \quad 0 \\ x^4 \quad x^3 \quad x^2 \quad x \end{array}$$

$$x^3 + x^2 - 10x + 8$$

19. $(x^3 - 7x + 6) \div (x - 2)$ Root = 2

$$\begin{array}{r} 2 \overline{) 1 \quad 0 \quad -7 \quad 6} \\ \underline{\oplus 2 \quad 4 \quad -4} \\ 1 \quad 2 \quad -3 \quad 0 \\ x^3 \quad x^2 \quad x \end{array}$$

$$x^2 + 2x - 3$$