

$$7. f(x) = x^3 + 2x^2 + 1$$

Describe the graph: from left to right: increase, decrease slightly, increase again
crosses x-axis: 1 time

X- Intercept(s): $(-2.21, 0)$

Leading coefficient: 1

Degree: 3

Number of terms: 3

Name of polynomial: cubic trinomial

Directions: Find each product.

$$8. xy(2x^4y + x^2y^2 - 3xy^3)$$

$$2x^5y^2 + x^3y^3 - 3x^2y^4$$

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

$$3x^5 + 6x^4 - 2x^3 + 3x^4 + 6x^3 - 2x^2 + 3x^2 + 6x - 2$$

$$3x^5 + 9x^4 + 4x^3 + x^2 + 6x - 2$$

$$10. (2xy + 5y)(3x^2 - 4xy + 2y^2)$$

$$6x^3y - 8x^2y^2 + 4xy^3 + 15x^2y - 20xy^2 + 10y^3$$

Directions: Use synthetic division to evaluate the polynomial for the given value.

19. $P(x) = x^4 + 3x^3 - x^2 + 2x - 6$ for $x = 3$

$$\begin{array}{r|rrrrr} 3 & 1 & 3 & -1 & 2 & -6 \\ & & 3 & 18 & 51 & 159 \\ \hline & 1 & 6 & 17 & 53 & 153 \end{array}$$

$$x^3 + 6x^2 + 17x + 53 + \frac{153}{x-3}$$

$$P(3) = 153$$

20. $P(x) = -3x^2 + 10x - 4$ for $x = -2$

$$\begin{array}{r|rrr} -2 & -3 & 10 & -4 \\ & & 6 & -32 \\ \hline & -3 & 16 & -36 \end{array}$$

$$-3x + 16 - \frac{36}{x+2}$$

$$P(-2) = -36$$

Directions: Determine whether the given binomial is a factor of the polynomial $P(x)$.

21. $(x - 4); P(x) = x^2 + 8x - 48$

$$\begin{array}{r|rrr} 4 & 1 & 8 & -48 \\ & & 4 & 48 \\ \hline & 1 & 12 & 0 \end{array}$$

$$x + 12$$

$$P(4) = 0, \text{ so } (x-4) \text{ is a factor of } P(x) = x^2 + 8x - 48$$

22. $(x + 5); P(x) = 2x^2 - 6x - 1$

$$\begin{array}{r|rrr} -5 & 2 & -6 & -1 \\ & & -10 & 80 \\ \hline & 2 & -16 & 79 \end{array}$$

$$2x - 16 + \frac{79}{x+5}$$

$$P(-5) \neq 0, \text{ so } (x+5) \text{ is not a factor of } P(x) = 2x^2 - 6x - 1$$

Directions: Divide by using long division.

11. $(6y^2 + 13y - 8) \div (2y - 1)$

$$\begin{array}{r} 3y+8 \\ 2y-1 \overline{) 6y^2+13y-8} \\ \underline{-6y^2+3y} \\ 16y-8 \\ \underline{-16y+8} \\ 0 \end{array}$$

$3y+8$

12. $(8x^4 + 6x^2 - 2x + 4) \div (2x - 1)$

$$\begin{array}{r} 4x^3+2x^2+4x+1 \\ 2x-1 \overline{) 8x^4+0x^3+6x^2-2x+4} \\ \underline{-8x^4+4x^3} \\ 4x^3+6x^2-2x+4 \\ \underline{-4x^3+2x^2} \\ 8x^2-2x+4 \\ \underline{-8x^2+4x} \\ 2x+4 \\ \underline{-2x+1} \\ 5 \end{array}$$

$4x^3+2x^2+4x+1 + \frac{5}{2x}$

13. $(2y^4 + 5y^3 + 2y^2 + 6y) \div (2y)$

$$\frac{2y^4}{2y} + \frac{5y^3}{2y} + \frac{2y^2}{2y} + \frac{6y}{2y}$$

$y^3 + \frac{5}{2}y^2 + y + 3$

14. $(x^3 - 5x^2 + 2x - 7) \div (x + 2)$

$$\begin{array}{r} x^2-7x+16 \\ x+2 \overline{) x^3-5x^2+2x-7} \\ \underline{-x^3+2x^2} \\ -7x^2+2x-7 \\ \underline{+7x^2+14x} \\ 16x-7 \\ \underline{-16x+32} \\ -39 \end{array}$$

$x^2-7x+16 - \frac{39}{x+2}$

Directions: Divide by using synthetic division.

15. $(3x^2 - 8x + 4) \div (x - 2)$

$$\begin{array}{r} 2 \overline{) 3 \quad -8 \quad 4} \\ \phantom{2 \overline{) }} 6 \quad -4 \\ \hline 3 \quad -2 \quad 0 \end{array}$$

$3x-2$

16. $(5x^2 - 4x + 12) \div (x + 3)$

$$\begin{array}{r} -3 \overline{) 5 \quad -4 \quad 12} \\ \phantom{-3 \overline{) }} 15 \quad 57 \\ \hline 5 \quad -19 \quad 69 \end{array}$$

$5x-19 + \frac{69}{x+3}$

17. $(-7x + 9x^2 + 3) \div (x - 1)$

$$\begin{array}{r} 1 \overline{) 9 \quad -7 \quad 3} \\ \phantom{1 \overline{) }} 9 \quad 2 \\ \hline 9 \quad 2 \quad 5 \end{array}$$

$9x+2 + \frac{5}{x-1}$

18. $(6x^5 - 3x^2 + x - 4) \div (x - 1)$

$$\begin{array}{r} 1 \overline{) 6 \quad 0 \quad 0 \quad -3 \quad 1 \quad -4} \\ \phantom{1 \overline{) }} 6 \quad 6 \quad 6 \quad 3 \quad 4 \\ \hline 6 \quad 6 \quad 6 \quad 3 \quad 4 \quad 0 \end{array}$$

$6x^4+6x^3+6x^2+3x+4$

Factor each completely.

$$1) (280xy - 105x)(-120y^2 + 45y)$$

$$35x(8y - 3) - 15y(8y - 3)$$

$$(35x - 15y)(8y - 3)$$

$$5(7x - 3y)(8y - 3)$$

$$2) x^2 + 14x + 45$$

$$(x + 9)(x + 5)$$

$$3) 25n^2 - 20n + 4$$

$$(5n - 2)(5n - 2)$$

$$(5n - 2)^2$$

$$4) x^4 + 27x \quad a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$x(x^3 + 27) \quad x(x + 3)[x^2 - (x)(3) + 3^2]$$

$$(x)^3 + (3)^3 \quad x(x + 3)(x^2 - 3x + 9)$$

$$a = x$$

$$b = 3$$

$$5) (2v^3 + v^2)(2v + 1)$$

$$v^2(2v + 1) + 1(2v + 1)$$

$$(v^2 + 1)(2v + 1)$$

$$6) 64n^2 + 112n + 49$$

$$(8n + 7)(8n + 7)$$

$$(8n + 7)^2$$

$$7) -8x^3 + 27 \quad a^3 + b^3 = (a + b)(a^2 - ab + b^2) \quad 8) 7x^3 + x^2$$

$$(-2x)^3 + (3)^3 \quad x^2(7x + 1)$$

$$a = -2x \quad (-2x + 3)[(-2x)^2 - (-2x)(3) + 3^2]$$

$$b = 3 \quad (-2x + 3)(4x^2 + 6x + 9)$$

$$9) 2a^2 + a - 15$$

P(-30)	S(1)
-5, 6	✓

$$(2a^2 + 6a)(-5a - 15)$$

$$2a(a + 3) - 5(a + 3)$$

$$(2a - 5)(a + 3)$$

$$10) 3a^3 - 16a^2 + 20a$$

$$a(3a^2 - 16a + 20)$$

P(60)	S(-16)
-10, -6	✓

$$a(3a^2 - 6a)(-10a + 20)$$

$$3a(a - 2) - 10(a - 2)$$

$$a(3a - 10)(a - 2)$$