

## More on Factors, Zeros, and Dividing

**Factor each and find all zeros. One factor has been given.**

1)  $f(x) = x^3 + 9x^2 + 23x + 15$ ;  $x + 5$

2)  $f(x) = x^3 - x^2 - 14x + 24$ ;  $x - 3$

3)  $f(x) = x^4 + 3x^3 - 13x^2 - 15x$ ;  $x - 3$

4)  $f(x) = x^3 - 12x^2 + 47x - 60$ ;  $x - 3$

5)  $f(x) = x^3 - 7x^2 + 2x + 40$ ;  $x - 5$

6)  $f(x) = x^3 - 3x^2 - 9x + 27$ ;  $x - 3$

7)  $f(x) = 10x^3 + 37x^2 + 37x + 6$ ;  $5x + 1$

8)  $f(x) = 25x^3 + 150x^2 + 131x + 30$ ;  $5x + 3$

9)  $f(x) = 5x^3 + 21x^2 - 21x - 5; x + 5$

10)  $f(x) = 3x^3 - 4x^2 - 9x + 10; x - 2$

11)  $f(x) = 5x^3 + 9x^2 - 26x - 24; x + 3$

12)  $f(x) = 6x^3 + 7x^2 - 1; 2x + 1$

**Factor each and find all zeros. One zero has been given.**

13)  $f(x) = 5x^3 + 4x^2 - 20x - 16; 2$

14)  $f(x) = 25x^4 - 40x^3 - 19x^2 - 2x; -\frac{1}{5}$

15)  $f(x) = 3x^4 + 5x^3 + 81x + 135; -\frac{5}{3}$

16)  $f(x) = 2x^4 - x^3 - 18x^2 + 9x; -3$

17)  $f(x) = 10x^3 - 41x^2 + 32x + 20; \frac{5}{2}$

18)  $f(x) = 3x^3 + 4x^2 - 35x - 12; 3$

## More on Factors, Zeros, and Dividing

Factor each and find all zeros. One factor has been given.

1)  $f(x) = x^3 + 9x^2 + 23x + 15$ ;  $x + 5$

Factors to:  $f(x) = (x + 1)(x + 3)(x + 5)$

Zeros:  $\{-1, -3, -5\}$

2)  $f(x) = x^3 - x^2 - 14x + 24$ ;  $x - 3$

Factors to:  $f(x) = (x - 2)(x + 4)(x - 3)$

Zeros:  $\{2, -4, 3\}$

3)  $f(x) = x^4 + 3x^3 - 13x^2 - 15x$ ;  $x - 3$

Factors to:  $f(x) = x(x + 1)(x + 5)(x - 3)$

Zeros:  $\{0, -1, -5, 3\}$

4)  $f(x) = x^3 - 12x^2 + 47x - 60$ ;  $x - 3$

Factors to:  $f(x) = (x - 4)(x - 5)(x - 3)$

Zeros:  $\{4, 5, 3\}$

5)  $f(x) = x^3 - 7x^2 + 2x + 40$ ;  $x - 5$

Factors to:  $f(x) = (x + 2)(x - 4)(x - 5)$

Zeros:  $\{-2, 4, 5\}$

6)  $f(x) = x^3 - 3x^2 - 9x + 27$ ;  $x - 3$

Factors to:  $f(x) = (x + 3)(x - 3)^2$

Zeros:  $\{-3, 3 \text{ mult. } 2\}$

3 (order 2)

7)  $f(x) = 10x^3 + 37x^2 + 37x + 6$ ;  $5x + 1$

Factors to:  $f(x) = (2x + 3)(x + 2)(5x + 1)$

Zeros:  $\left\{-\frac{3}{2}, -2, -\frac{1}{5}\right\}$

8)  $f(x) = 25x^3 + 150x^2 + 131x + 30$ ;  $5x + 3$

Factors to:  $f(x) = (5x + 2)(x + 5)(5x + 3)$

Zeros:  $\left\{-\frac{2}{5}, -5, -\frac{3}{5}\right\}$

$$9) f(x) = 5x^3 + 21x^2 - 21x - 5; x + 5$$

$$\text{Factors to: } f(x) = (5x + 1)(x - 1)(x + 5)$$

$$\text{Zeros: } \left\{ -\frac{1}{5}, 1, -5 \right\}$$

$$10) f(x) = 3x^3 - 4x^2 - 9x + 10; x - 2$$

$$\text{Factors to: } f(x) = (3x + 5)(x - 1)(x - 2)$$

$$\text{Zeros: } \left\{ -\frac{5}{3}, 1, 2 \right\}$$

$$11) f(x) = 5x^3 + 9x^2 - 26x - 24; x + 3$$

$$\text{Factors to: } f(x) = (5x + 4)(x - 2)(x + 3)$$

$$\text{Zeros: } \left\{ -\frac{4}{5}, 2, -3 \right\}$$

$$12) f(x) = 6x^3 + 7x^2 - 1; 2x + 1$$

$$\text{Factors to: } f(x) = (3x - 1)(x + 1)(2x + 1)$$

$$\text{Zeros: } \left\{ \frac{1}{3}, -1, -\frac{1}{2} \right\}$$

**Factor each and find all zeros. One zero has been given.**

$$13) f(x) = 5x^3 + 4x^2 - 20x - 16; 2$$

$$\text{Factors to: } f(x) = (5x + 4)(x + 2)(x - 2)$$

$$\text{Zeros: } \left\{ -\frac{4}{5}, -2, 2 \right\}$$

$$14) f(x) = 25x^4 - 40x^3 - 19x^2 - 2x; -\frac{1}{5}$$

$$\text{Factors to: } f(x) = x(5x + 1)^2(x - 2)$$

$$\text{Zeros: } \left\{ 0, -\frac{1}{5} \text{ mult. } 2, 2 \right\}$$

$$15) f(x) = 3x^4 + 5x^3 + 81x + 135; -\frac{5}{3}$$

$$\text{Factors to: } f(x) = (x + 3)(x^2 - 3x + 9)(3x + 5)$$

$$\text{Zeros: } \left\{ -3, \frac{3 + 3i\sqrt{3}}{2}, \frac{3 - 3i\sqrt{3}}{2}, -\frac{5}{3} \right\}$$

*imaginary roots*

$$16) f(x) = 2x^4 - x^3 - 18x^2 + 9x; -3$$

$$\text{Factors to: } f(x) = x(2x - 1)(x - 3)(x + 3)$$

$$\text{Zeros: } \left\{ 0, \frac{1}{2}, 3, -3 \right\}$$

$$17) f(x) = 10x^3 - 41x^2 + 32x + 20; \frac{5}{2}$$

$$\text{Factors to: } f(x) = (5x + 2)(x - 2)(2x - 5)$$

$$\text{Zeros: } \left\{ -\frac{2}{5}, 2, \frac{5}{2} \right\}$$

$$18) f(x) = 3x^3 + 4x^2 - 35x - 12; 3$$

$$\text{Factors to: } f(x) = (3x + 1)(x + 4)(x - 3)$$

$$\text{Zeros: } \left\{ -\frac{1}{3}, -4, 3 \right\}$$