2-10-17

Practice Finding Factors, Zeros, Roots, Solutions, X-Intercepts Given a Zero or A Factor:

Do Your Work On Your Own Paper.

1. $f(x) = x^3 - 5x^2 - 2x + 24; x = -2$

$-2 \mid 1 \quad -5 \quad -2 \quad 24$
$\quad\quad \downarrow \quad -2 \quad 14 \quad -24$
$\quad\quad 1x^2 \quad -7x \quad 12 \mid 0$

$x^2 - 7x + 12$

$x^2 - 7x + 12 = 0$

$(x-4)(x-3) = 0$

$x - 4 = 0 \qquad x - 3 = 0$

$x = 4 \qquad x = 3$

12 / -4×-3 / -7

Solutions:

$x = 4, 3, -2$

Factors:

$(x-4)(x-3)(x+2)$

2. $f(x) = x^3 - 12x^2 + 12x + 80; f(10) = 0$

$10 \mid 1 \quad -12 \quad 12 \quad 80$
$\quad\quad \downarrow \quad 10 \quad -20 \quad -80$
$\quad\quad 1x^2 \quad -2x \quad -8 \mid 0$

$x^2 - 2x - 8$

$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

$x - 4 = 0 \qquad x + 2 = 0$

$x = 4 \qquad x = -2$

-8 / -4×2 / -2

Roots:

$f(4) = 0$

$f(-2) = 0$

$f(10) = 0$

Factors:

$(x-4)(x+2)(x-10)$

3. $f(x) = x^3 - x^2 - 21x + 45; (x+5)$

$-5 \mid 1 \quad -1 \quad -21 \quad 45$
$\quad\quad \downarrow \quad -5 \quad 30 \quad -45$
$\quad\quad 1x^2 \quad -6x \quad 9 \mid 0$

$x^2 - 6x + 9$

$x^2 - 6x + 9 = 0$

$(x-3)(x-3) = 0$

$x - 3 = 0 \qquad x - 3 = 0$

$x = 3 \qquad x = 3$

9 / -3×-3 / -6

Zeroes:

$x = 3, 3, -5$

$= 3$ mult. 2, -5

Factors:

$(x+5)(x-3)^2$

④ $f(x) = 4x^3 - 4x^2 - 9x + 9; (x-1)$

$1 \mid 4 \quad -4 \quad -9 \quad 9$
$\quad\quad \downarrow \quad 4 \quad 0 \quad -9$
$\quad\quad 4x^2 \quad 0x \quad -9 \mid 0$

$4x^2 - 9$

$4x^2 - 9 = 0$

$(2x)^2 - (3)^2 = 0$

$(2x-3)(2x+3) = 0$

$2x - 3 = 0 \qquad 2x + 3 = 0$

$2x = 3 \qquad 2x = -3$

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

$4x^2 - 9 = 0$

$4x^2 = 9$

$x^2 = \frac{9}{4}$

$x = \pm\sqrt{\frac{9}{4}}$

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

x-intercepts:

$f(\frac{3}{2}) = 0$

$f(-\frac{3}{2}) = 0$

$f(1) = 0$

Factors:

$(2x-3)(2x+3)(x-1)$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

5. $f(x) = 5x^3 - 27x^2 - 17x - 6; x = 6$

6	5	-27	-17	-6
	↓	30	18	6
	5	3	1	0

$5x^2 + 3x + 1$

$5x^2 + 3x + 1 = 0$

$a = 5, b = 3, c = 1$

$x = \frac{-3 \pm \sqrt{(3)^2 - 4(5)(1)}}{2(5)}$

$= \frac{-3 \pm \sqrt{-11}}{10}$

$= \frac{-3 \pm i\sqrt{11}}{10}$

Solutions:

$x = -3 \pm i\sqrt{11}$

$x = 6$

6. $f(x) = 3x^4 + 11x^3 + 11x^2 + x - 2; f(-2) = 0, f(-1) = 0$

-1	3	11	11	1	-2
	↓	-3	-8	-3	2
	$3x^3$	$8x^2$	$3x$	-2	0

-2	3	8	3	-2
	↓	-6	-4	2
	$3x^2$	$2x$	-1	0

$3x^2 + 2x - 1$

$(3x^2 + 2x - 1 = 0)$

$x^2 + 2x - 3$

$(x + \frac{3}{3})(x - \frac{1}{3})$

$(x + 1)(3x - 1) = 0$

$x + 1 = 0 \quad 3x - 1 = 0$

$x = -1 \quad 3x = 1$

$x = \frac{1}{3}$

Roots:

$x = -1, \frac{1}{3}, -2, -1$

$= -1$ mult. 2, $\frac{1}{3}, -2$

Factors:

$(x+1)(3x-1)(x+2)(x+1)$

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

⑦ $f(x) = x^4 - 3x^3 + 6x^2 - 2x - 12; x = 2, x = -1$

2	1	-3	6	-2	-12
	↓	2	-2	8	12
	$1x^3$	$-1x^2$	$4x$	6	0

-1	1	-1	4	6
	↓	-1	2	-6
	$1x^2$	$-2x$	6	0

$x^2 - 2x + 6$

$x^2 - 2x + 6 = 0$

$a = 1, b = -2, c = 6$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(6)}}{2(1)}$

$= \frac{2 \pm \sqrt{-20}}{2}$

$= \frac{2 \pm \sqrt{-1 \cdot 4 \cdot 5}}{2}$

$= \frac{2 \pm \sqrt{-1}\sqrt{2 \cdot 2 \cdot 5}}{2}$

$= \frac{2 \pm 2i\sqrt{5}}{2}$

$= \frac{1 \pm i\sqrt{5}}{1}$

$= 1 \pm i\sqrt{5}$

x-intercepts:

$x = 1 \pm i\sqrt{5}$

$x = 2, -1$