

Finding Zeroes Using Factoring

Solve each equation by factoring.

$$1) x^2 - x = 20 \quad x^2 - x - 20 = 0 \quad \boxed{x=5}$$

$$(x-5)(x+4) \quad \boxed{x=-4}$$

$$3) 7x^2 - 224 = 28x \quad 7x^2 - 28x - 224 = 0$$

$$7(x^2 - 4x - 32) \quad \boxed{x=8}$$

$$7(x-8)(x+4) \quad \boxed{x=-4}$$

Factor each.

$$5) x^4 - 4x^2 - 21 = 0$$

$$\boxed{(x^2-7)(x^2+3)}$$

$$7) x^4 - 15x^2 + 54 = 0 \quad (x^2-9)(x^2-6)$$

$$\boxed{(x+3)(x-3)(x^2-6)}$$

Factor each completely.

$$8) (12b^3 - 8b^2)(3b-2)$$

$$4b^2(3b-2) + 1(3b-2)$$

$$\boxed{(4b^2+1)(3b-2)}$$

Find all zeros.

$$10) f(x) = 5x^3 - 6x^2 - 8x$$

$$x(5x^2 - 6x - 8) = 0$$

$$x(5x+4)(x-2) = 0$$

$$\boxed{x=0 \quad x=-\frac{4}{5} \quad x=2}$$

$$12) f(x) = 3x^3 + 8x^2 + 5x$$

$$x(3x^2 + 8x + 5) = 0$$

$$x(3x+5)(x+1) = 0$$

$$\boxed{x=0 \quad x=-\frac{5}{3} \quad x=-1}$$

$$2) 5n^2 + 35n = -60 \quad 5(n^2 + 7n + 12) = 0$$

$$5(n+3)(n+4) = 0$$

$$\boxed{n=-3 \quad n=-4}$$

$$4) k^2 + k = 12$$

$$k^2 + k - 12 = 0$$

$$(k+4)(k-3) = 0$$

$$\boxed{k=-4}$$

$$\boxed{k=3}$$

$$6) x^4 - 2x^2 - 24 = 0$$

$$\boxed{(x^2-6)(x^2+4)}$$

$$9) (3v^3 + 2v^2)(9v+6) \quad v^2(3v+2) + 3(3v+2)$$

$$\boxed{(v^2+3)(3v+2)}$$

$$11) f(x) = 2x^3 - 15x^2 + 25x$$

$$x(2x^2 - 15x + 25) = 0$$

$$x(2x-5)(x-5) = 0$$

$$\boxed{x=0 \quad x=\frac{5}{2} \quad x=5}$$

$$13) f(x) = 3x^3 + 11x^2 - 20x$$

$$x(3x^2 + 11x - 20) = 0$$

$$x(3x-4)(x+5) = 0$$

$$\boxed{x=0 \quad x=\frac{4}{3} \quad x=-5}$$

Key

## Writing Polynomial Functions given the zeroes

Write a polynomial function of least degree that has real coefficients, the following zeros, and a leading coefficient of 1.

1) -3, -2, 5

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

$(x^2+5x+6)(x-5)$

$x^3+5x^2+6x-5x^2-25x-30$

$x^3-19x-30$

2) 2, -4,  $-\frac{3}{4}$

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

$(x-2)(4x^2+19x+12)$

$4x^3+19x^2+12x-8x^2-38x-24$

$4x^3+11x^2-26x-24$

3) 5,  $3i$

$(x-5)(x+3i)(x-3i)$

$(x-5)(x^2+9)$

$x^3-5x^2+9x-45$

4)  $-\frac{1}{3}$ ,  $-3-2i$

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

$(3x+1)(x^2+6x+13)$

$3x^3+18x^2+39x+x^2+6x+13$

$3x^3+19x^2+45x+13$

Note:  $x = -3 - 2i$   $\left\{ \begin{array}{l} x = -3 + 2i \\ x + 3 = -2i \\ x + 3 + 2i = 0 \end{array} \right. \left\{ \begin{array}{l} x + 3 = 2i \\ x + 3 - 2i = 0 \end{array} \right.$