

# Chapter 5 (C1) Review Answers (Final Exam)

Write a polynomial function in standard form with the given zeros.

24.  $x = 0, 4, \frac{1}{2}$

25.  $x = 0, 0, 2, 3$

26.  $x = -1, -2, -3, -4$

$$y = x(x-4)(x+\frac{1}{2})$$

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

$$y = (x+1)(x+2)(x+3)(x+4)$$

$$y = x(x^2 - \frac{7}{2}x - 2)$$

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

$$y = (x^2 + 3x + 2)(x^2 + 7x + 12)$$

$$y = x^3 - \frac{7}{2}x^2 - 2x$$

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

$$y = x^4 + 7x^3 + 12x^2 + 3x^3 + 2x^2 + 36x + 2x^2 + 14x + 24$$

$$y = x^4 + 10x^3 + 33x^2 + 50x + 24$$

Find the real or imaginary solutions of each equation by factoring.

14.  $(x^3 - 2x^2)(5x + 10) = 0$

15.  $6x^2 - 13x - 5 = 0$

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

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

$(-2, 0), \pm i\sqrt{5}$

22.  $x^4 - 12x^2 = 64$

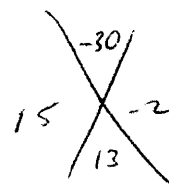
$u = x^2$

$$x^4 - 12x^2 - 64 = 0$$

$$(u-16)(u+4) = 0$$

$$(x^2-16)(x^2+4) = 0$$

$(4, 0), (-4, 0), \pm 2i$



$$6x^2 + 15x - 2x - 5 = 0$$

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

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

$(-5, 0), (\frac{1}{3}, 0)$

23.  $x^4 - 7x^2 = 18$

$$x^4 + 7x^2 - 18 = 0$$

$u = x^2$

$$(u+9)(u-2) = 0$$

$$(x^2+9)(x^2-2) = 0$$

$\pm 3i, (\sqrt{2}, 0), (-\sqrt{2}, 0)$

Find the real or imaginary solutions of each equation by factoring.

40.  $x^3 - 6x^2 + 6x = 0$

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

$x = 0$

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

$x = \frac{6 \pm \sqrt{36 - 24}}{2}$

$x = \frac{6 \pm \sqrt{12}}{2}$

41.  $12x^3 = 60x^2 + 75x$

$12x^3 - 60x^2 - 75x = 0$

$3x(4x^2 - 20x - 25) = 0$

$3x = 0$   
 $x = 0$

$x = \frac{20 \pm \sqrt{(-20)^2 - 4(4)(-25)}}{2(4)}$

$x = \frac{20 \pm \sqrt{400 + 400}}{8}$

$x = \frac{20 \pm \sqrt{800}}{8}$

or

$x = \frac{20 \pm \sqrt{400 \cdot 2}}{8}$

$x = \frac{20 \pm 20\sqrt{2}}{8}$

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

46.  $8x^3 + 27 = 0$

$a = 2x \quad b = 3$

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

$(2x+3)(4x^2 - 6x + 9) = 0$

$x = \frac{6 \pm \sqrt{(-6)^2 - 4(4)(9)}}{2(4)}$

$x = \frac{6 \pm \sqrt{36 - 144}}{8}$

$x = \frac{6 \pm \sqrt{-108}}{8}$

$x = \frac{6 \pm i\sqrt{108}}{8}$

or  $x = \frac{6 \pm i\sqrt{36 \cdot 3}}{8}$

$x = \frac{6 \pm 6i\sqrt{3}}{8}$

$x = \frac{3 \pm 3i\sqrt{3}}{4}$

47.  $(10x^3 + 5x^2)(4x + 2) = 0$

$5x^2(2x+1) + 2(2x+1) = 0$

$(2x+1)(5x^2+2) = 0$

$2x+1 = 0$

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

$5x^2 + 2 = 0$

$5x^2 = -2$   
 $\sqrt{x^2} = \sqrt{-\frac{2}{5}}$

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

or

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

$x = \pm i \frac{\sqrt{10}}{5}$

Divide using long division.

$$9. (x^2 - 3x - 40) \div (x + 5)$$

$$\begin{array}{r} x-8 \\ x+5 \overline{) x^2 - 3x - 40} \\ \underline{-(x^2 + 5x)} \\ -8x - 40 \\ \underline{-(-8x - 40)} \\ 0 \end{array}$$

$$x-8$$

$$10. (3x^2 + 7x - 20) \div (x + 4)$$

$$\begin{array}{r} 3x-5 \\ x+4 \overline{) 3x^2 + 7x - 20} \\ \underline{-(3x^2 + 12x)} \\ -5x - 20 \\ \underline{-(-5x - 20)} \\ 0 \end{array}$$

$$3x-5$$

$$44. (2x^3 + 9x^2 + 14x + 5) \div (2x - 1)$$

$$\begin{array}{r} x^2 + 4x + 5 \\ 2x-1 \overline{) 2x^3 + 9x^2 + 14x + 5} \\ \underline{-(2x^3 + x^2)} \\ 8x^2 + 14x \\ \underline{-(8x^2 + 4x)} \\ 10x + 5 \end{array}$$

$$\begin{array}{r} 10x + 5 \\ \underline{-(10x + 5)} \\ 0 \end{array}$$

$$x^2 + 4x + 5$$

Determine whether each binomial is a factor of  $x^3 + 4x^2 + x - 6$ .

17.  $x + 1$

$$\begin{aligned} &(-1)^3 + 4(-1)^2 + (-1) - 6 \\ &-1 + 4 - 1 - 6 \\ &-4 \rightarrow \underline{\text{no}} \end{aligned}$$

18.  $x + 2$

$$\begin{aligned} &(-2)^3 + 4(2)^2 + (-2) - 6 \\ &-8 + 16 - 2 - 6 \\ &0 \rightarrow \underline{\text{yes}} \end{aligned}$$

Use synthetic division and the given factor to completely factor each polynomial function.

29.  $y = x^3 - 2x^2 - 5x - 6; (x + 1)$

$$\begin{array}{r|rrrrr} -1 & 1 & -2 & -5 & -6 \\ & & -1 & -1 & 6 \\ \hline & 1 & -3 & -6 & 0 \end{array}$$

$$(x+1)(x^2 - 3x - 6) = y$$

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

30.  $y = x^3 - 4x^2 - 9x + 36; (x - 3)$

$$\begin{array}{r|rrrrr} 3 & 1 & -4 & -9 & 36 \\ & & -3 & 21 & -36 \\ \hline & 1 & -7 & 12 & 0 \end{array}$$

$$(x-3)(x^2 - 7x + 12) = y$$

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

Write each in factored form, then find the roots.

10.  $x^3 + 4x^2 + x - 6 = 0$

$\frac{p's}{q's} = \pm 6, \pm 3, \pm 2, \pm 1$

$x = -3, -2, 1$

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

$$(-3, 0), (-2, 0), (1, 0)$$

12.  $x^4 - 4x^3 + 7x^2 - 16x + 12 = 0$

$\frac{p's}{q's} = \pm 12, \pm 6, \pm 4, \pm 3, \pm 2, \pm 1$

$x = -3, -1$

$$\begin{array}{r|rrrrrr} -3 & 1 & -4 & 7 & -16 & 12 \\ & & -3 & -3 & -12 & -12 \\ \hline -1 & 1 & -1 & 4 & 4 \\ & & -1 & 0 & -4 \\ \hline & 1 & 0 & 4 & & \end{array}$$

$(x^2+4)(x-3)(x-1) = 0$   
 $\hookrightarrow x = \pm 2i$

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

$$(3, 0), (1, 0), \pm 2i$$

13.  $x^4 - 4x^3 + x^2 + 12x - 12 = 0$

$\pm 12, \pm 6, \pm 4, \pm 3, \pm 2, \pm 1$

~~10/2~~  $x = 2$  (ends up being a double root)

$$\begin{array}{r|rrrrr} 2 & 1 & -4 & 1 & 12 & -12 \\ & & 2 & -4 & -6 & 12 \\ \hline \end{array}$$

$$\begin{array}{r|rrrr} 2 & 1 & -2 & -3 & 6 \\ & & 2 & 0 & -6 \\ \hline \end{array}$$

~~10/2~~

$(x-2)^2(x^2-3) = 0 \rightarrow x = \pm\sqrt{3}$

$(x-2)(x-2)(x-\sqrt{3})(x+\sqrt{3}) = 0$

$(2, 0), (\sqrt{3}, 0), (-\sqrt{3}, 0)$

14.  $x^5 - 3x^3 - 4x = 0$

$x(x^4 + 3x^2 - 4) = 0$        $u = x^2$

$x(u^2 + 3u - 4) = 0$

$x(u+4)(u-1) = 0$

$x(x^2+4)(x^2-1) = 0$

$x=0, x = \pm 2i, x = \pm 1$

$$x(x+1)(x-1)(x+2i)(x-2i) = 0$$

$$(0, 0), (1, 0), (-1, 0), \pm 2i$$