

Section 4.3 – Practice ProblemsFind the x – intercepts by factoring the following equations.

1. $y = x^2 - 3x - 4$

$(x-4)(x+1)$

$x\text{-int: } (4,0)$

$(-1,0)$

2. $y = x^2 + x - 6$

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

$(-3,0)$

$(2,0)$

3. $y = -x^2 + 4$

$-(x^2 - 4)$

Difference of Squares.

$-(x+2)(x-2)$

$(-2,0)$ and $(2,0)$

4. $y = -\frac{1}{2}x^2 - x + 4$

$-\frac{1}{2}(x^2 + 2x - 8)$

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

$(-4,0), (2,0)$

5. $y = 2x^2 + 5x - 3$

$x^2 + 5x - 6$

$(x + \frac{6}{2})(x - \frac{1}{2})$

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

$(-3,0)$ and $(\frac{1}{2},0)$

6. $y = -\frac{1}{3}x^2 + 3$

$-\frac{1}{3}(x^2 - 9)$

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

$(-3,0), (3,0)$

Solve the following equations. Check your solutions to make sure they are correct

7. $2x(4x - 3) = 0$

$x = 0$

$x = \frac{3}{4}$

$2(0)(4(0) - 3) = 0$

$0 = 0$

$2(\frac{3}{4})[4(\frac{3}{4}) - 3] = 0$

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

$0 = 0$

8. $(0.25y - 2)(0.2y + 1) = 0$

$\frac{1}{4}y - 2 = 0 \rightarrow \frac{1}{4}y = 2$

$y = 8$

$\frac{2}{10}y + 1 = 0 \rightarrow \frac{1}{5}y = -1$

$y = -5$

9. $x^2 = -x$

$$x^2 + x = 0$$

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

$$x = 0$$

$$x = -1$$

10. $x^2 + 1 = 0$

$$x^2 = -1$$

NOT POSSIBLE

NO SOLUTION

11. $4y^2 = y$

$$4y^2 - y = 0$$

$$y(4y-1) = 0$$

$$y = 0$$

$$y = \frac{1}{4}$$

12. $3x^2 - x = 0$

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

$$x = 0$$

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

13. $x^2 + 5x + 6 = 0$

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

$$x = -3 \quad x = -2$$

$$(-3)^2 + 5(-3) + 6 = 0 \quad (-2)^2 + 5(-2) + 6 = 0$$

$$9 - 15 + 6 = 0$$

$$0 = 0$$

$$4 - 10 + 6 = 0$$

$$0 = 0$$

14. $x^2 - 4x + 3 = 0$

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

$$x = 1$$

$$x = 3$$

15. $y^2 + y - 12 = 0$

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

$$y = -4$$

$$y = 3$$

16. $z^3 - 16z = 0$

$$z(z^2 - 16) = 0$$

$$z(z+4)(z-4) = 0$$

$$z = 0$$

$$z = 4$$

$$z = -4$$

17. $z(z-5) = -4$

$$z^2 - 5z + 4 = 0$$

$$(z-4)(z-1) = 0$$

$z = 4$
$z = 1$

18. $(x-12)(x+1) = -40$

$$x^2 + x - 12x - 12 + 40 = 0$$

$$x^2 - 11x + 28 = 0$$

$$(x-4)(x-7) = 0$$

$x = 4$	$x = 7$
---------	---------

19. $(y-6)(y+1) = -10$

$$y^2 + y - 6y - 6 + 10 = 0$$

$$y^2 - 5y + 4 = 0$$

$$(y-1)(y-4) = 0$$

$y = 1$
$y = 4$

20. $z^3 - z^2 = 6z$

$$z^3 - z^2 - 6z = 0$$

$$z(z^2 - z - 6) = 0$$

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

$z = 0$
$z = 3$
$z = -2$

21. $x^3 - 3x = 2x^2$

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

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

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

$x = 0$
$x = 3$
$x = -1$

22. $\frac{x^2}{18} + \frac{x}{6} = 1$

$$\left(\frac{x^2}{18} + \frac{x}{6} - 1 = 0\right)^{1e}$$

$$x^2 + 3x - 18 = 0$$

$$(x+6)(x-3) = 0$$

$x = -6$
$x = 3$

23. $(2x - 1)^2 = 16$

$$(2x - 1)(2x - 1) = 16$$

$$4x^2 - 4x + 1 - 16 = 0$$

$$4x^2 - 4x - 15 = 0$$

AC: $x^2 - 4x - 60 = 0$

$$\left(x - \frac{10}{4}\right)\left(x + \frac{6}{4}\right) = 0$$

$$\left(x - \frac{5}{2}\right)\left(x + \frac{3}{2}\right) = 0$$

$$(2x - 5)(2x + 3) = 0$$

$$x = \frac{5}{2} \text{ and } x = -\frac{3}{2}$$

24. $(3x + 8)(x - 1) = (x - 1)(x + 3)$

$$3x^2 - 3x + 8x - 8 = x^2 + 2x - 3$$

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

$$x^2 + 3x - 10 = 0$$

$$\left(x + \frac{5}{2}\right)\left(x - 2\right) = 0$$

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

$$x = -\frac{5}{2} \text{ and } x = 1$$

25. $(2y)^2 + (y + 5)^2 = (2y + 4)^2$

$$4y^2 + y^2 + 10y + 25 = (2y + 4)(2y + 4)$$

$$5y^2 + 10y + 25 = 4y^2 + 16y + 16$$

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

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

$$y - 3 = 0$$

$$y = 3$$

26. $6x^2(3x - 1) - x(3x - 1) = 2(3x - 1)$

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

$$6x^2 - x = 2 \quad \leftarrow \begin{matrix} 1 \\ \text{cancel} \end{matrix}$$

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

AC: $x^2 - x - 12 = 0$

$$\left(x - \frac{4}{6}\right)\left(x + \frac{3}{6}\right) = 0$$

$$\left(x - \frac{2}{3}\right)\left(x + \frac{1}{2}\right) = 0$$

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

$x = \frac{1}{3}$ is also a solution even though we cancelled it.

$$27. \frac{1}{x} + \frac{3}{x-2} = \frac{5}{8}$$

LCD
 $x(x-2)(8)$

$$1(x-2)(8) + 3(x)(8) = 5(x)(x-2)$$

$$8x - 16 + 24x = 5x^2 - 10x$$

$$5x^2 - 42x + 16 = 0$$

$$\text{AC } x^2 - 42x + 80 = 0$$

$$(x - \frac{40}{5})(x - \frac{2}{5}) = 0$$

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

$$x = 8$$

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

$$28. \frac{4}{5} + y = \frac{4y - 50}{5y - 25}$$

LCD: $5(y-5)$

$$\frac{4}{5} + y = \frac{2(2y - 25)}{5(y-5)}$$

$$4(y-5) + y(y-5)(5) = 4y - 50$$

$$4y - 20 + 5y^2 - 25y = 4y - 50$$

$$5y^2 - 25y + 30 = 0$$

$$5(y^2 - 5y + 6) = 0$$

$$5(y-2)(y-3) = 0$$

$$\boxed{y=2 \quad y=3}$$

$$29. \frac{4}{x^2-4} - \frac{1}{x-2} = 1$$

LCD:

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

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

$$4 - x - 2 = x^2 - 4$$

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

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

$$\boxed{x = -3}$$

$x = 2$ ← reject
gives
denominator of 0

$$30. \frac{1}{x-3} - \frac{12}{x^2-9} = 1$$

LCD: $(x+3)(x-3)$

$$\frac{1}{x-3} - \frac{12}{(x+3)(x-3)} = 1$$

$$(x+3) - 12 = (x+3)(x-3)$$

$$x+3-12 = x^2-9$$

$$x-9 = x^2-9$$

$$x^2 - x = 0$$

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

$$\boxed{x=0 \quad x=1}$$

Complete the square and solve using the square root method, give exact answers

31. $x^2 + 6x = -5$

$$x^2 + 6x + 9 - 9 = -5$$

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

$$(x+3)^2 = 4$$

$$x+3 = \pm 2$$

$$x = -3 \pm 2$$

$$x = -1$$

$$x = -5$$

32. $y^2 - 5y + 3 = 0$

$$y^2 - 5y + \frac{25}{4} - \frac{25}{4} + 3 = 0$$

$$\left(y - \frac{5}{2}\right)^2 - \frac{25}{4} + \frac{12}{4} = 0$$

$$\left(y - \frac{5}{2}\right)^2 - \frac{13}{4} = 0 \rightarrow \left(y - \frac{5}{2}\right)^2 = \frac{13}{4}$$

$$y - \frac{5}{2} = \pm \sqrt{\frac{13}{4}} \rightarrow y - \frac{5}{2} = \pm \frac{\sqrt{13}}{2}$$

$$y = \frac{5}{2} \pm \frac{\sqrt{13}}{2}$$

$$y = \frac{5 + \sqrt{13}}{2}, \frac{5 - \sqrt{13}}{2}$$

33. $z^2 - 8z + 3 = 0$

$$z^2 - 8z + 16 - 16 + 3 = 0$$

$$(z-4)^2 - 13 = 0$$

$$(z-4)^2 = 13$$

$$z-4 = \pm \sqrt{13}$$

$$z = 4 \pm \sqrt{13}$$

$$z = 4 + \sqrt{13}$$

$$z = 4 - \sqrt{13}$$

34. $x^2 - 2x - 1 = 0$

$$x^2 - 2x + 1 - 1 - 1 = 0$$

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

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

$$x-1 = \pm \sqrt{2}$$

$$x = 1 \pm \sqrt{2}$$

$$x = 1 + \sqrt{2}$$

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

35. $y^2 + 4y + 2 = 0$

$$y^2 + 4y + 4 - 4 + 2 = 0$$

$$(y+2)^2 - 2 = 0$$

$$(y+2)^2 = 2$$

$$y+2 = \pm\sqrt{2}$$

$$y = -2 \pm \sqrt{2}$$

$$y = -2 + \sqrt{2}$$

$$y = -2 - \sqrt{2}$$

36. $z^2 + 2z + 7 = 0$

$$z^2 + 2z + 1 - 1 + 7 = 0$$

$$(z+1)^2 + 6 = 0$$

$$(z+1)^2 = -6$$

NOT POSSIBLE

NO SOLUTION

37. $5x^2 - 3x = 1$

$$5x^2 - 3x = 1$$

$$5\left(x^2 - \frac{3x}{5}\right) = 1$$

$$5\left(x^2 - \frac{3}{5}x + \frac{9}{100} - \frac{9}{100}\right) = 1$$

$$5\left(x - \frac{3}{10}\right)^2 - \frac{9}{20} = 1$$

$$5\left(x - \frac{3}{10}\right)^2 = \frac{29}{20}$$

$$\left(x - \frac{3}{10}\right)^2 = \frac{29}{100}$$

$$x - \frac{3}{10} = \pm \frac{\sqrt{29}}{10}$$

$$x = \frac{3 + \sqrt{29}}{10}$$

$$x = \frac{3 - \sqrt{29}}{10}$$

38. $3x^2 - x = 3$

$$3x^2 - x = 3$$

$$3\left(x^2 - \frac{1}{3}x\right) = 3$$

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

$$x^2 - \frac{1}{3}x + \frac{1}{36} - \frac{1}{36} = 1$$

$$\left(x - \frac{1}{6}\right)^2 = \frac{37}{36}$$

$$x - \frac{1}{6} = \pm \frac{\sqrt{37}}{6}$$

$$x = \frac{1 + \sqrt{37}}{6}$$

$$x = \frac{1 - \sqrt{37}}{6}$$

39. $3x^2 = -8x - 2$

$$3x^2 + 8x + 2 = 0$$

$$3\left(x^2 + \frac{8}{3}x\right) + 2 = 0$$

$$3\left(x^2 + \frac{8}{3}x + \frac{16}{9} - \frac{16}{9}\right) + 2 = 0$$

$$3\left(x^2 + \frac{8}{3}x + \frac{16}{9}\right) - \frac{16}{3} + 2 = 0$$

$$3\left(x + \frac{4}{3}\right)^2 - \frac{16}{3} + \frac{6}{3} = 0$$

$$3\left(x + \frac{4}{3}\right)^2 - \frac{10}{3} = 0$$

$$\left(x + \frac{4}{3}\right)^2 = \frac{10}{6} \cdot \frac{10}{9}$$

$$\left(x + \frac{4}{3}\right)^2 = \frac{5}{3} \cdot \frac{10}{9}$$

$$x + \frac{4}{3} = \pm \sqrt{\frac{5}{3}} \cdot \sqrt{\frac{10}{9}}$$

$$x = -\frac{4}{3} \pm \sqrt{\frac{5}{3}} \cdot \frac{\sqrt{10}}{3}$$

$$x = -\frac{4}{3} + \frac{\sqrt{10}}{3}$$

$$x = -\frac{4}{3} - \frac{\sqrt{10}}{3}$$

can be simplified further.

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

$$3x^2 - 6x = 2$$

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

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

$$x^2 - 2x + 1 - 1 = \frac{2}{3}$$

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

$$x-1 = \sqrt{\frac{5}{3}}$$

$$x = 1 \pm \sqrt{\frac{5}{3}}$$

$$x = 1 + \sqrt{\frac{5}{3}}$$

$$x = 1 - \sqrt{\frac{5}{3}}$$