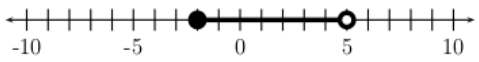
3 Solving Equations Practice Problems

1. Which of the following numbers is included in the graph? **The answers are in bold.**

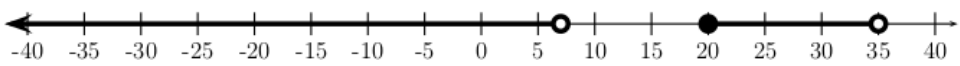


   (a) -5
   (b) $\mathbf{-2}$
   (c) **0**
   (d) 5
   (e) 8

2. Which of the following numbers are included in the interval $(-\infty, 7) \cup [20, 35)$? **The answers are in bold.**

   (a) $\mathbf{-2,000,000}$
   (b) **0**
   (c) **6.99999**
   (d) 7
   (e) 7.00000001
   (f) 15
   (g) 19.99999
   (h) **20**
   (i) **20.00000001**
   (j) **24**
   (k) **34.99999**
   (l) 35
   (m) 35.00000001
   (n) $2,000,000$

3. Sketch the graph of $(-\infty, 7) \cup [20, 35)$.



4. Find the exact value of $|\pi - 6|$. Your answer may not include absolute value symbols. **The answer is in bold.**

$$\mathbf{6 - \pi}$$

5. Solve each equation or inequality algebraically. As you solve the equation or inequality, discuss the geometry (i.e., the number line) behind each step.

   (a) $|x-7|=5$

   Solution: $x=2,12$

   (b) $|2x+5|-3=1$

   Solution: $x=-\frac{9}{2},-\frac{1}{2}$

   (c) $|x+1|=|2x-1|$

   Solution: $x=0,2$

   (d) $3|4x+1|=9$

   Solution: $x=-1,\frac{1}{2}$

   (e) $3|4-x|+6=2$

   No Real Solutions

6. Three pairs of equations are listed below. For each pair, determine if the two equations are equivalent. **The answers are in bold.**

   (a) $x+5=2$ and $2x+10=4$

   CIRCLE ONE: **EQUIVALENT** NOT EQUIVALENT

   (b) $x=2$ and $x^2=4$

   CIRCLE ONE: EQUIVALENT **NOT EQUIVALENT**

   (c) $\frac{1}{x}=5$ and $1=5x$

   CIRCLE ONE: **EQUIVALENT** NOT EQUIVALENT

7. Multiplying both sides of an equation by x^2+1 (**always**/sometimes/never) produces an equivalent equation. **The answer is in bold.**

8. Multiplying both sides of an equation by $|x|$ (always/**sometimes**/never) produces an equivalent equation. **The answer is in bold.**

9. Solve. (Describe the steps that are being applied to the variable. Think about how you will undo these to solve the equation.)

   (a) $4(x-2)^2-3=0$

   Solution: $x=2\pm\frac{\sqrt{3}}{2}$

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

   No Real Solutions

   (c) $4(x-2)^2-3=4x^2$

   Solution: $x=\frac{13}{16}$

(d) $\frac{8-2s}{5} = 13$

Solution: $s = -\dfrac{57}{2}$

(e) $-5[14 - (3x+1)^3] = 11$

Solution: $\dfrac{\sqrt[3]{16.2} - 1}{3}$

10. Solve for a.

$$a + b = c(d + f)$$

Solution: $a = c(d + f) - b$

11. Solve for c.

$$a + b = c(d + f)$$

Solution: $c = \dfrac{a+b}{d+f}$

12. Solve for d.

$$a + b = c(d + f)$$

Solution: $d = \dfrac{a+b}{c} - f$

13. Solve for h.

$$V = \frac{\pi d^2 h}{4}$$

Solution: $h = \dfrac{4V}{\pi d^2}$

14. Solve for d.

$$V = \frac{\pi d^2 h}{4}$$

Solution: $d = \pm\sqrt{\dfrac{4V}{\pi h}}$

This is the formula for the volume of a cylinder. Does this simplify your solution? **If we know that this is the formula for the volume of a cylinder, then all the variables measure lengths and thus, we do not need to consider the negative square root.**

15. Solve.

(a) $\dfrac{3y^2 - 2y + 14}{y^2 + y - 2} = \dfrac{5}{y - 1}$

Solution: $y = \dfrac{4}{3}$

(b) $\dfrac{x}{x+2} = \dfrac{5}{x} + 1$

Solution: $x = -\dfrac{10}{7}$

16. Use the Zero Product Property to solve the quadratic equation.

(a) $x^2 - 14 = 3x + 14$

Solutions: $x = -4, 7$

(b) $3x^2 + 16x + 5 = 0$

Solutions: $x = -5, -\dfrac{1}{3}$

17. Solve the quadratic equation by completing the square.

(a) $x^2 - 2x = 12$

Solution: $x = 1 \pm \sqrt{13}$

(b) $3x^2 = 12x + 1$

Solution: $x = 2 \pm \dfrac{\sqrt{13}}{3}$

18. How many solutions does each equation have?

(I) $x^3 + 5 = 0$ **(II)** $x^4 = -4$

Possibilities:

(a) Equation **(I)** has 3 solutions, and equation **(II)** has no solutions.
(b) Equation **(I)** has 3 solutions, and equation **(II)** has 1 solution.
(c) Equation **(I)** has 1 solution, and equation **(II)** has 2 solutions.
(d) Equation **(I)** has no solutions, and equation **(II)** has 2 solutions.
(e) Equation (I) has 1 solution, and equation (II) has no solutions.

19. Solve the quadratic equation by a method of your choice.

(a) $20x + 35 = 3x^2 + 4x$

Solution:$x = \dfrac{16 \pm 26}{6} = 14, -\dfrac{5}{2}$

(b) $7x^2 + x + 1 = 0$

No Real Solutions

20. Find a number k such that the equation has exactly one real solution.

$$x^2 + kx + 25 = 0$$

Solution: $k = \pm 10$

21. Solve.

(a) $2x^6 = 9x^3 + 5$

Solutions: $x = -\sqrt[3]{\frac{1}{2}}, \sqrt[3]{5}$

(b) $3x^{1/2} + x^{1/4} - 10 = 0$

Solutions: $x = \frac{625}{81}$

(c) $t^3 - 2t^5 = 0$

Solution: $t = 0, \pm\sqrt{\frac{1}{2}}$

(d) $\sqrt{3z - 5} = 3 - z$

Solution: $z = 2$

(e) $3\sqrt{t} + 10 = t$

Solution: $t = 25$

22. For each of the following equations, determine which technique you could use to solve the equation. There may be more than one or zero techniques.

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

(b) $3x^5 - 7 = 2$

(c) $x^5 + 3\sqrt{x} = 7$

(d) $\frac{5}{x+2} - \frac{5+x}{2x} = \frac{7x}{x+2}$

(e) $-4x + 3[5(x + 7) - 3x + 2] = 7(x + 5)$

(f) $\frac{1}{x+2} = 5x$

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

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

(i) $x^4 + 2x = 0$

On homework, quizzes, and exams, you will not be told which technique you should use. You should practice identifying techniques that can help you solve a problem.