1. ../Individual-Questions-by-Topics/Rational-Expressions/Simplify-Rational-Expression-I-001.tex

   Simplify the rational expression.
   $$\frac{15x^2 - 37x + 20}{5x - 4}.$$

   **Solution:**
   $$\begin{aligned}&\frac{15x^2 - 37x + 20}{5x - 4}\\ =&\frac{(3x-5)(5x-4)}{5x-4}\\ =&3x-5.\end{aligned}$$

2. ../Individual-Questions-by-Topics/Rational-Expressions/Simplify-Rational-Expression-I-002.tex

   Simplify the rational expression.
   $$\frac{8x^2 - 26x + 15}{4x^2 - 4x - 15}.$$

   **Solution:**
   $$\begin{aligned}&\frac{8x^2 - 26x + 15}{4x^2 - 4x - 15}\\ =&\frac{(2x-5)(4x-3)}{(2x-5)(2x+3)}\\ =&\frac{4x-3}{2x+3}.\end{aligned}$$

3. ../Individual-Questions-by-Topics/Rational-Expressions/Simplify-Rational-Expression-I-003.tex

   Simplify the rational expression.
   $$\frac{x^3 + 5x^2 + 5x + 25}{x + 5}.$$

**Solution:**

$$
\begin{aligned}
&\frac{x^3 + 5x^2 + 5x + 25}{x + 5}\\
=&\frac{(x^3 + 5x^2) + (5x + 25)}{x + 5}\\
=&\frac{x^2(x + 5) + 5(x + 5)}{x + 5}\\
=&\frac{(x^2 + 5)(x + 5)}{x + 5}\\
=&x^2 + 5
\end{aligned}
$$

4. ../Individual-Questions-by-Topics/Rational-Expressions/Multiply-Simplify-I-001.tex

   Simplify the rational expression.

$$\frac{4x^2 - 11x - 3}{3x^2 - 14x + 15} \cdot \frac{9x^2 - 25}{16x^2 - 1}.$$

**Solution:**

$$
\begin{aligned}
&\frac{4x^2 - 11x - 3}{3x^2 - 14x + 15} \cdot \frac{9x^2 - 25}{16x^2 - 1}\\
=&\frac{(x - 3)(4x + 1)}{(x - 3)(3x - 5)} \cdot \frac{(3x - 5)(3x + 5)}{(4x - 1)(4x + 1)}\\
=&\frac{3x + 5}{4x - 1}.
\end{aligned}
$$

5. ../Individual-Questions-by-Topics/Rational-Expressions/Multiply-Simplify-I-002.tex

   Simplify the rational expression.

$$\frac{8x+2}{9x^2-16} \cdot \frac{3x^2-13x+12}{4x^2+1x}.$$

> **Solution:**
>
> $$\begin{aligned} &\frac{8x+2}{9x^2-16} \cdot \frac{3x^2-13x+12}{4x^2+1x} \\ =&\frac{2(4x+1)}{(3x-4)(3x+4)} \cdot \frac{(x-3)(3x-4)}{x(4x+1)} \\ =&\frac{2(x-3)}{x(3x+4)}. \end{aligned}$$

6. ../Individual-Questions-by-Topics/Rational-Expressions/Divide-Simplify-I-001.tex

   Simplify the rational expression.

$$\frac{12x+9}{4x^2-25} \div \frac{4x^2+3x}{2x+5}.$$

> **Solution:**
>
> $$\begin{aligned} &\frac{12x+9}{4x^2-25} \div \frac{4x^2+3x}{2x-5} \\ =&\frac{12x+9}{4x^2-25} \cdot \frac{2x-5}{4x^2+3x} \\ =&\frac{3(4x+3)}{(2x-5)(2x+5)} \cdot \frac{2x-5}{x(4x+3)} \\ =&\frac{3}{x(2x+5)}. \end{aligned}$$

7. ../Individual-Questions-by-Topics/Rational-Expressions/Divide-Simplify-I-002.tex

   Simplify the rational expression.

$$\frac{5x^2-7x-6}{6xy-2y} \div \frac{25x^2-9}{3x^2-7x+2}.$$

**Solution:**

$$
\begin{aligned}
&\frac{5x^2-7x-6}{6xy-2y} \div \frac{25x^2-9}{3x^2-7x+2} \\
=&\frac{5x^2-7x-6}{6xy-2y} \cdot \frac{3x^2-7x+2}{25x^2-9} \\
=&\frac{(x-2)(5x+3)}{2y(3x-1)} \cdot \frac{(x-2)(3x-1)}{(5x-3)(5x+3)} \\
=&\frac{(x-2)^2}{2y(5x-3)}
\end{aligned}
$$

8. ../Individual-Questions-by-Topics/Rational-Expressions/Divide-Simplify-I-003.tex

Simplify the rational expression.

$$\frac{x^2-9}{x^2-2x-15} \div \frac{x}{x-5}.$$

**Solution:**

$$
\begin{aligned}
&\frac{x^2-9}{x^2-2x-15} \div \frac{x}{x-5} \\
=&\frac{x^2-9}{x^2-2x-15} \cdot \frac{x-5}{x} \\
=&\frac{(x+3)(x-3)}{(x+3)(x-5)} \cdot \frac{x-5}{x} \\
=&\frac{x-3}{x}.
\end{aligned}
$$

9. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Same-Denominator-I-001.tex

Simplify the rational expression.

$$\frac{3x^2-11x}{5x^2-18x-8}-\frac{2x-4}{5x^2-18x-8}.$$

**Solution:**

$$\begin{aligned}
&\frac{3x^2-11x}{5x^2-18x-8}-\frac{2x-4}{5x^2-18x-8}.\\
=&\frac{3x^2-13x+4}{5x^2-18x-8}\\
=&\frac{(x-4)(3x-1)}{(x-4)(5x+2)}\\
=&\frac{3x-1}{5x+2}
\end{aligned}$$

10. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Diff-Denominator-I-001.tex

Simplify the rational expression.

$$\frac{7}{x^2+x-12}+\frac{2}{x^2-8x+15}.$$

**Solution:**

$$\begin{aligned}
&\frac{7}{x^2+x-12}+\frac{2}{x^2-8x+15}.\\
=&\frac{7}{(x-3)(x+4)}+\frac{2}{(x-3)(x-5)}\\
=&\frac{7(x-5)+2(x+4)}{(x-3)(x+4)(x-5)}\\
=&\frac{9x-27}{(x-3)(x+4)(x-5)}\\
=&\frac{9}{(x+4)(x-5)}
\end{aligned}$$

11. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Diff-Denominator-I-002.tex

Simplify the rational expression.

$$\frac{-2}{x^2-6x+8}-\frac{-3}{x^2-7x+10}.$$

**Solution:**

$$\begin{aligned}
&\frac{-2}{x^2-6x+8}-\frac{-3}{x^2-7x+10}.\\
=&\frac{-2}{(x-2)(x-4)}-\frac{-3}{(x-2)(x-5)}\\
=&\frac{-2(x-5)--3(x-4)}{(x-2)(x-4)(x-5)}\\
=&\frac{x-2}{(x-2)(x-4)(x-5)}\\
=&\frac{1}{(x-4)(x-5)}
\end{aligned}$$

12. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Diff-Denominator-I-003.tex

Simplify the rational expression.

$$\frac{x}{x^2-4x+3}-\frac{-3}{x^2-8x+15}.$$

**Solution:**

$$\begin{aligned}
&\frac{x}{x^2-4x+3}-\frac{-3}{x^2-8x+15}.\\
=&\frac{x}{(x-3)(x-1)}-\frac{-3}{(x-3)(x-5)}\\
=&\frac{x(x-5)-(-3)(x-1)}{(x-3)(x-1)(x-5)}\\
=&\frac{x^2-2x-3}{(x-3)(x-1)(x-5)}\\
=&\frac{(x-3)(x+1)}{(x-3)(x-1)(x-5)}\\
=&\frac{(x+1)}{(x-1)(x-5)}
\end{aligned}$$

13. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Diff-Denominator-I-004.tex

Simplify the rational expression.

$$\frac{x+2}{x+5}-\frac{7}{x+3}.$$

**Solution:**

$$\begin{aligned}
&\frac{x+2}{x+5} - \frac{7}{x+3} \\
=&\frac{(x+2)(x+3) - 7(x+5)}{(x+5)(x+3)} \\
=&\frac{x^2 - 2x - 29}{(x+5)(x+3)}
\end{aligned}$$

14. ../Individual-Questions-by-Topics/Rational-Expressions/Add-Subtract-Diff-Denominator-I-005.tex

Simplify the rational expression.

$$\frac{x^2 - 26}{x^2 + 10x + 24} - \frac{x+1}{x+6}.$$

**Solution:**

$$\begin{aligned}
&\frac{x^2 - 26}{x^2 + 10x + 24} - \frac{x+1}{x+6} \\
=&\frac{x^2 - 26}{(x+4)(x+6)} - \frac{x+1}{x+6} \\
=&\frac{(x^2 - 26) - (x+4)(x+1)}{(x+4)(x+6)} \\
=&\frac{-5x - 30}{(x+4)(x+6)} \\
=&\frac{-5}{x+4}
\end{aligned}$$

15. ../Individual-Questions-by-Topics/Rational-Expressions/Complex-Rational-Expressions-I-001.tex

Simplify the rational expression.

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

**Solution:**

$$\begin{aligned}\frac{\frac{2}{x}-\frac{1}{x^2}}{\frac{3}{x}+\frac{1}{x^2}} &= \frac{\frac{2x-1}{x^2}}{\frac{3x+1}{x^2}}\\ &= \frac{2x-1}{x^2}\cdot\frac{x^2}{3x+1}\\ &= \frac{2x-1}{3x+1}\end{aligned}$$

16. ../Individual-Questions-by-Topics/Rational-Expressions/Complex-Rational-Expressions-I-002.tex

Simplify the complex rational expression.

$$\frac{\frac{3}{x-4}-\frac{1}{x+3}}{\frac{3}{x-4}+\frac{1}{x+3}}.$$

**Solution:**

$$\begin{aligned}\frac{\frac{3}{x-4}-\frac{1}{x+3}}{\frac{3}{x-4}+\frac{1}{x+3}} &= \frac{\frac{3(x+3)-(x-4)}{(x-4)(x+3)}}{\frac{3(x+3)+(x-4)}{(x-4)(x+3)}}\\ &= \frac{3(x+3)-(x-4)}{3(x+3)+(x-4)}\\ &= \frac{2x+13}{4x+5}\\ &= \frac{2x+13}{4x+5}\end{aligned}$$

17. ../Individual-Questions-by-Topics/Rational-Expressions/Complex-Rational-Expressions-I-003.tex

Simplify the rational expression.

$$\frac{2-\frac{5}{x+1}}{2+\frac{5}{x+1}}.$$

**Solution:**

$$\begin{aligned}\frac{\frac{2(x+1)-5}{x+1}}{\frac{2(x+1)+5}{x+1}} &= \frac{2(x+1)-5}{2(x+1)+5} \\ &= \frac{2x-3}{2x+7}\end{aligned}$$

18. ../Individual-Questions-by-Topics/Rational-Expressions/Rational-Equation-I-001.tex

Solve the rational equation
$$\frac{5}{x-4} - \frac{7}{x-3} = 0.$$

**Solution:**

$$\begin{aligned}\frac{5}{x-4} - \frac{7}{x-1} &= 0 \\ (x-3)(x-4)\frac{5}{x-4} - (x-3)(x-4)\frac{7}{x-3} &= 0 \\ 5(x-3) - 7(x-4) &= 0 \\ -2x + 13 &= 0 \\ x &= \frac{13}{2}\end{aligned}$$

19. ../Individual-Questions-by-Topics/Rational-Expressions/Rational-Equation-I-002.tex

    Solve the rational equation
$$\frac{1}{x-3} - \frac{1}{x-2} = \frac{1}{2}.$$

**Solution:**

$$\begin{aligned}
\frac{1}{x-3} - \frac{1}{x-2} &= \frac{1}{2} \\
2[(x-2)-(x-3)] &= (x-3)(x-2) \\
2 &= x^2 - 5x + 6 \\
x^2 - 5x + 4 &= 0 \\
(x-4)(x-1) &= 0
\end{aligned}$$

$$\begin{aligned}
x - 4 &= 0 \quad \text{or} \quad & x - 1 &= 0 \\
x &= 4 & x &= 1
\end{aligned}$$

20. ../Individual-Questions-by-Topics/Rational-Expressions/Rational-Equation-I-003.tex

    Solve the rational equation
$$\frac{2}{3x-1} - \frac{16}{12x^2+11x-5} = \frac{x}{4x+5}.$$

**Solution:**

$$\begin{aligned}
\frac{2}{3x-1} - \frac{16}{12x^2+11x-5} &= \frac{x}{4x+5} \\
\frac{2}{(3x-1)} - \frac{16}{(3x-1)(4x+5)} &= \frac{x}{4x+5} \\
2(4x+5) - 16 &= x(3x-1) \\
3x^2 - 9x + 6 &= 0 \\
(3x+6)(x-1) &= 0
\end{aligned}$$

$$\begin{aligned}
3x + 6 &= 0 \quad \text{or} \quad & x - 1 &= 0 \\
x &= 2 & x &= 1
\end{aligned}$$

21. ../Individual-Questions-by-Topics/Rational-Expressions/Rational-Equation-I-004.tex

    Solve the rational equation

$$\frac{3}{5x-1}+\frac{1}{3x+5}=\frac{6}{15x^2+22x-5}.$$

**Solution:**

$$\begin{aligned}\frac{3}{5x-1}+\frac{1}{3x+5}&=\frac{6}{15x^2+22x-5}\\ 3(3x+5)+(5x-1)&=6\\ 14x+8&=0\\ x&=-\frac{4}{7}\end{aligned}$$

22. ../Individual-Questions-by-Topics/Rational-Expressions/Rational-Equation-I-005.tex

    Solve for $y$ from the rational equation

$$\frac{4}{p}+\frac{1}{y}=\frac{6}{b}.$$

**Solution:**

$$\begin{aligned}\frac{4}{p}+\frac{1}{y}&=\frac{6}{b}\\ 4by+pb&=6py\\ 4by-6py&=-pb\\ (4b-6p)y&=-pb\\ y&=\frac{pb}{6p-4b}\end{aligned}$$

23. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-I-001.tex

    Simplify the radical expression.

$$\sqrt[6]{(-2)^6(x-5)^6b^{24}}.$$

**Solution:**

$$\sqrt[6]{(-2)^6(x-5)^6b^{24}} = \sqrt[6]{64(x-5)^6b^{24}} = \sqrt[6]{[2(x-5)b^4]^6} = 2|x-5|b^4.$$

24. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-I-002.tex

Simplify the radical expression.

$$\sqrt[3]{-125x^9y^9}.$$

**Solution:**

$$\sqrt[3]{-125x^9y^9} = \sqrt[3]{(-5x^3y^3)^3} = -5x^3y^3.$$

25. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-I-003.tex

Simplify the radical expression.

$$\sqrt[3]{-\frac{64a^3}{8y^{12}}}.$$

**Solution:**

$$\sqrt[3]{-\frac{64a^3}{8y^{12}}} = \sqrt[3]{\left(-\frac{3a}{2y^4}\right)^3} = -\frac{4a}{2y^4}.$$

26. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-I-004.tex

Simplify the radical expression (assume all variables are positive).

$$\sqrt[3]{8a^6y^9c^9}.$$

**Solution:**

$$\sqrt[3]{8a^6y^9c^9} = \sqrt[3]{(2a^2y^3c^3)^3} = 2a^2y^3c^3.$$

27. ../Individual-Questions-by-Topics/Radicals/Multiply-Simplify-Radicals-I-001.tex

Simplify the radical expression as much as possible (assume all variables are positive).

$$\sqrt{7x^4b^3}\sqrt{7b^3c^{10}}$$

**Solution:**
$$\sqrt{7x^4b^3}\sqrt{7b^3c^{10}} = \sqrt{49x^4b^6c^{10}} = \sqrt{(7x^2b^3c^5)^2} = 7x^2b^3c^5.$$

28. ../Individual-Questions-by-Topics/Radicals/Divide-Simplify-Radicals-I-001.tex

Simplify the radical expression as much as possible (assume all variables are positive).

$$\frac{\sqrt{1a^3y^2}}{\sqrt{4a^{11}z^{10}}}.$$

**Solution:**
$$\frac{\sqrt{1a^3y^2}}{\sqrt{4a^{11}z^{10}}} = \sqrt{\frac{1a^3y^2}{4a^{11}z^{10}}} = \sqrt{\frac{1y^2}{4a^8z^{10}}}. = \sqrt{\left(\frac{1y}{2a^4z^5}\right)^2} = \frac{1y}{2a^4z^5}.$$

29. ../Individual-Questions-by-Topics/Radicals/Radical-to-Rational-Exponent-I-001.tex

Write the radical expression as rational exponent (assume all variables are positive).

$$\sqrt[3]{a^2y^3}.$$

**Solution:**
$$\sqrt[3]{a^2y^3} = a^{\frac{2}{3}}y^1.$$

30. ../Individual-Questions-by-Topics/Radicals/Rational-Exponent-to-Radical-I-001.tex

Write the rational exponent as radical expression (assume all variables are positive).

$$x^1.$$

**Solution:**
$$x^1 = \sqrt[3]{x^3}.$$

31. ../Individual-Questions-by-Topics/Radicals/Rational-Exponent-to-Radical-I-002.tex

Write the rational exponent as radical expression (assume all variables are positive).

$$a^{\frac{7}{4}}y^{\frac{3}{4}}.$$

**Solution:**
$$a^{\frac{7}{4}}y^{\frac{3}{4}} = \sqrt[4]{a^7y^3}.$$

32. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-II-001.tex

Simplify the radical expression (assume all variables are positive).

$$\sqrt[4]{32x^{15}y^{23}}.$$

**Solution:**
$$\sqrt[4]{32x^{15}y^{23}} = \sqrt[4]{2^4x^{12}y^{20}\cdot 2x^3y^3} = 2x^3y^4\sqrt[4]{2x^3y^3}.$$

33. ../Individual-Questions-by-Topics/Radicals/Simplify-Radicals-II-002.tex

Simplify the radical expression (assume all variables are positive).

$$\sqrt[3]{-625a^4y^4}.$$

**Solution:**
$$\sqrt[3]{-625a^4y^4} = \sqrt[3]{(-5)^3a^3y^3\cdot 5ay} = -5ay\cdot\sqrt[3]{5ay}.$$

34. ../Individual-Questions-by-Topics/Radicals/Divide-Simplify-Radicals-II-001.tex

Simplify the radical expression (assume all variables are positive).

$$\frac{\sqrt{216x^7b^7}}{\sqrt{x^7b^7}}$$

**Solution:**
$$\frac{\sqrt{216x^7b^7}}{\sqrt{x^7b^7}} = \sqrt{\frac{216x^7b^7}{x^7b^7}} = \sqrt{216b^0} = 6\sqrt{6}.$$

35. ../Individual-Questions-by-Topics/Radicals/Divide-Simplify-Radicals-II-002.tex

Simplify the radical expression (assume all variables are positive).

$$\frac{\sqrt[5]{2x^9y^{19}}}{\sqrt[5]{-64x^6y^2}}$$

**Solution:**

$$\frac{\sqrt[5]{2x^9y^{19}}}{\sqrt[5]{-64x^6y^2}} = \sqrt[5]{\frac{2x^9y^{19}}{-64x^6y^2}} = \sqrt[5]{\frac{x^3y^{17}}{(-2)^5}} = -\frac{y^3\sqrt[5]{x^3y^2}}{2}.$$

36. ../Individual-Questions-by-Topics/Radicals/Simplify-Rational-Exponent-I-001.tex

Assume all variables are positive. Write the following expression with rational exponents in radical expression and simplify.

$$(100a^2y^8)^{\frac{1}{2}}$$

**Solution:**

$$(100a^2y^8)^{\frac{1}{2}} = \sqrt{100a^2y^8} = \sqrt{(10ay^4)^2} = 10ay^4.$$

37. ../Individual-Questions-by-Topics/Radicals/Simplify-Rational-Exponent-I-002.tex

Assume all variables are positive. Simplify and write your answer in radical notation.

$$(32x^{14}b^{27})^{\frac{1}{5}}$$

**Solution:**

$$(32x^{14}b^{27})^{\frac{1}{5}} = \sqrt[5]{32x^{14}b^{27}} = \sqrt[5]{2^5x^{10}b^{25}\cdot x^4b^2} = 2x^2b^5\sqrt[5]{x^4b^2}.$$

38. ../Individual-Questions-by-Topics/Radicals/Simplify-Rational-Exponent-I-003.tex

Assume all variables are positive. Write the following expression with rational exponents and simplify to the form $\frac{x^p}{x^q}$.

$$\left(\frac{x^2y}{y^4}\right)^{\frac{2}{5}}$$

**Solution:**

$$\left(\frac{x^2y}{y^4}\right)^{\frac{2}{5}} = \left(\frac{x^2}{y^3}\right)^{\frac{2}{5}} = \frac{x^{2\cdot\frac{2}{5}}}{y^{3\cdot\frac{2}{5}}} = \frac{x^{\frac{4}{5}}}{y^{\frac{8}{5}}}.$$

39. ../Individual-Questions-by-Topics/Radicals/Combining-Like-Radicals-I-001.tex

Simplify the following expression and write in radical form.

$$7\sqrt{3} - 5\sqrt{27} - 3\sqrt{81}$$

**Solution:**

$$\begin{aligned}7\sqrt{3}-5\sqrt{27}-3\sqrt{81} =& 7\sqrt{3}-5\sqrt{3^2 3}-3\sqrt{3^4}\\ =& 7\cdot 3^0\cdot\sqrt{3}-5\cdot 3\cdot\sqrt{3}-3\cdot 3^2\\ =& 7\sqrt{3}-15\sqrt{3}-27\\ =& -8\sqrt{3}-27.\end{aligned}$$

40. ../Individual-Questions-by-Topics/Radicals/Combining-Like-Radicals-I-002.tex

    Assume the variable $x$ is positive. Simplify the following expression and write in radical form.

$$\sqrt[4]{16x^9}-5\sqrt[4]{x^{13}}$$

**Solution:**

$$\begin{aligned}\sqrt[4]{16x^9}-5\sqrt[4]{x^{13}} =& \sqrt[4]{2^4\cdot x^8\cdot x}-5\sqrt[4]{x^{12}\cdot x}\\ =& 2x^2\sqrt[4]{x}-5x^3\sqrt[4]{x}\\ =& (2x^2-5x^3)\sqrt[4]{x}.\end{aligned}$$

41. ../Individual-Questions-by-Topics/Radicals/Multiply-Simplify-Radicals-I-002.tex

    Assume all variables are positive. Simplify the following expression as much as possible.

$$2\sqrt{2}\left(5\sqrt{12}+7\sqrt{6}\right)$$

**Solution:**

$$2\sqrt{2}\left(5\sqrt{12}+7\sqrt{6}\right) = 10\sqrt{4\cdot 6}+14\sqrt{4\cdot 3} = 10\sqrt{4}\cdot\sqrt{6}+14\sqrt{4}\cdot\sqrt{6} = 20\sqrt{6}+28\sqrt{3}.$$

42. ../Individual-Questions-by-Topics/Radicals/Multiply-Simplify-Radicals-II-001.tex

    Assume all variables are positive. Simplify the following expression as much as possible.

$$(3\sqrt{a}+4\sqrt{b})(5\sqrt{a}-7\sqrt{b})$$

**Solution:**

$$(3\sqrt{a}+4\sqrt{b})(5\sqrt{a}-7\sqrt{b}) = 15a+20\sqrt{ab}-21\sqrt{ab}-28b = 15a-28b-1\sqrt{ab}.$$

43. ../Individual-Questions-by-Topics/Radicals/Rationalize-Denominator-I-001.tex

Rationalize the denominator and simplify as much as possible.

$$\frac{5\sqrt{2}+6}{7\sqrt{2}-5}$$

**Solution:**

$$\begin{aligned}\frac{5\sqrt{2}+6}{7\sqrt{2}-5} &= \frac{(5\sqrt{2}+6)(7\sqrt{2}+5)}{(7\sqrt{2}-5)(7\sqrt{2}+5)}\\ &= \frac{(5\sqrt{2}+6)(7\sqrt{2}+5)}{7^2\cdot 2-5^2}\\ &= \frac{352+42\sqrt{2}+25\sqrt{2}+30}{73}\\ &= \frac{100+67\sqrt{2}}{73}\\ &= \frac{100}{73}+\frac{67}{73}\sqrt{2}.\end{aligned}$$

44. ../Individual-Questions-by-Topics/Radicals/Rationalize-Denominator-I-002.tex

Rationalize the denominator and simplify as much as possible.

$$\frac{3\sqrt{y}-6}{\sqrt{y^3}}$$

**Solution:**

$$\frac{3\sqrt{y}-6}{\sqrt{y^3}} = \frac{(3\sqrt{y}-6)\sqrt{y}}{\sqrt{y^3}\sqrt{y}} = \frac{3y-6\sqrt{y}}{\sqrt{y^4}} = \frac{3y-6\sqrt{y}}{y^2}.$$

45. ../Individual-Questions-by-Topics/Radicals/Rationalize-Denominator-I-003.tex

Rationalize the denonimator and simplify as much as possible.

$$\frac{5\sqrt{r}-2}{7\sqrt{r}-3}$$

**Solution:**

$$\begin{aligned}
\frac{5\sqrt{r}-2}{7\sqrt{r}-3} &= \frac{(5\sqrt{r}-2)(7\sqrt{r}+3)}{(7\sqrt{r}-3)(7\sqrt{r}+3)} \\
&= \frac{(5\sqrt{r}-2)(7\sqrt{r}+3)}{49r-9} \\
&= \frac{35r-14\sqrt{r}+15\sqrt{r}-6}{49r-9} \\
&= \frac{35r+\sqrt{r}-6}{49r-9}
\end{aligned}$$

46. ../Individual-Questions-by-Topics/Radicals/Divide-Complex-Numbers-I-001.tex

Write the quotient of complex numbers in the form $a + b\mathbf{i}$, where $\mathbf{i}$ is the imaginary unit.

$$\frac{4+5\mathbf{i}}{-4+7\mathbf{i}}$$

**Solution:**

$$\begin{aligned}
\frac{4+5\mathbf{i}}{-4+7\mathbf{i}} &= \frac{(4+5\mathbf{i})(-4-7\mathbf{i})}{(-4+7\mathbf{i})(-4-7\mathbf{i})} \\
&= \frac{-16-28\mathbf{i}-20\mathbf{i}+35}{7^2+4^2} \\
&= \frac{-16-28\mathbf{i}-20\mathbf{i}+35}{65} \\
&= \frac{19-48\mathbf{i}}{65} \\
&= \frac{19}{65}-\frac{48}{65}\mathbf{i}
\end{aligned}$$

47. ../Individual-Questions-by-Topics/Radicals/Divide-Complex-Numbers-I-002.tex

Write the quotient in the form $a + b\mathbf{i}$, where $\mathbf{i}$ is the imaginary unit.

$$\frac{2\sqrt{-1}+9}{\sqrt{-1}}$$

**Solution:**

$$\frac{2\sqrt{-1}+9}{\sqrt{-1}} = \frac{2\mathbf{i}+9}{\mathbf{i}} = \frac{(2\mathbf{i}+9)\mathbf{i}}{(\mathbf{i})^2} = \frac{-2+9\mathbf{i}}{-1} = 2-9\mathbf{i}.$$

48. ../Individual-Questions-by-Topics/Radicals/Divide-Complex-Numbers-II-001.tex

Write the quotient of complex numbers in the form $a + b\mathbf{i}$, where $\mathbf{i}$ is the imaginary unit.

$$\frac{(3-3\mathbf{i})(-3\mathbf{i})}{1+\mathbf{i}}$$

**Solution:**

$$\begin{aligned}\frac{(3-3\mathbf{i})(-3\mathbf{i})}{1-3\mathbf{i}} &= \frac{-9-9\mathbf{i}}{1+\mathbf{i}}\\ &= \frac{(-9-9\mathbf{i})(1-\mathbf{i})}{(1+\mathbf{i})(1-\mathbf{i})}\\ &= \frac{0+0\mathbf{i}}{1-1\cdot(-1)}\\ &= \frac{0+0\mathbf{i}}{2}\\ &= 0\end{aligned}$$

49. ../Individual-Questions-by-Topics/Radicals/Solve-Radical-Equations-I-001.tex

Solve the following radical equation

$$\sqrt[3]{3x+18} - 4 = -1.$$

**Solution:**

$$\begin{aligned}
\sqrt[3]{3x+18} - 4 &= -1 \\
\sqrt[3]{3x+18} &= 3 \\
3x + 18 &= 27 \\
3x &= 9 \\
x &= 3
\end{aligned}$$

50. ../Individual-Questions-by-Topics/Radicals/Solve-Radical-Equations-I-002.tex

Solve the following radical equation

$$\sqrt{3x-21}+x=7.$$

**Solution:**

$$\begin{aligned}\sqrt{3x-21}+x&=7\\ \sqrt{3x-21}&=7-x\\ 3x-21&=(x-7)^2\\ 3x-21&=x^2-2\cdot 7\cdot x+7^2\\ x^2-17x+70&=0\end{aligned}$$

$$\begin{aligned} x-7&=0 \quad \text{or} \quad & x-10&=0\\ x&=7 \quad \text{or} \quad & x&=10\end{aligned}$$

Check the solutions.

When $x=7$, the left hand side of the equation equals

$$\sqrt{3\cdot 7-21}+7=\sqrt{0}+7=7.$$

So $x=7$ is a solution.

When $x=10$, the left hand side of the equation equals

$$\sqrt{3\cdot 10-21}+7=\sqrt{3^2}+7=3+7\neq 7.$$

So $x=10$ is not a solution.

Therefore, the equation has only one solution $x=7$.

51. ../Individual-Questions-by-Topics/Radicals/Solve-Radical-Equations-I-003.tex

Solve the following radical equation

$$\sqrt{x+3}-\sqrt{x-37}=4.$$

**Solution:**

$$\begin{aligned}\sqrt{x+3}-\sqrt{x-37}&=4\\ \sqrt{x+3}&=\sqrt{x-37}+4\\ x+3&=(\sqrt{x-37}+4)^2\\ x+3&=x-37+8\sqrt{x-37}+16\\ 24&=8\sqrt{x-37}\\ \sqrt{x-37}&=3\\ x-37&=9\\ x&=46\end{aligned}$$

Check the solutions. The left hand side of the equation equals

$$\sqrt{46+3}-\sqrt{46-37}=7-3=4.$$

Therefore, the equation has only one solution $x = 46$.

52. ../Individual-Questions-by-Topics/Radicals/Solve-Radical-Equations-I-004.tex

    Solve the following radical equation

$$\sqrt[3]{1x+6}=2.$$

**Solution:**

$$\begin{aligned} \sqrt[3]{1x+6} &= 2 \\ 1x+6 &= 8 \\ 1x &= 2 \\ x &= 2. \end{aligned}$$

53. ../Individual-Questions-by-Topics/Radicals/Solve-Radical-Equations-I-005.tex

    Solve the following radical equation

$$x-\sqrt{4x-16}=4.$$

**Solution:**

$$\begin{aligned} x-\sqrt{4x-16} &= 4 \\ x-4 &= \sqrt{4x-16} \\ (x-4)^2 &= 4x-16 \\ x^2-8x+4^2 &= 4x-16 \\ x^2-12x+32 &= 0 \end{aligned}$$

$$\begin{aligned} x-4 &= 0 \quad \text{or} \quad x-8=0 \\ x &= 4 \quad \text{or} \quad x=8 \end{aligned}$$

Check the solutions.

When $x = 4$, the left hand side of the equation equals

$$4 - \sqrt{4 \cdot 4 - 16} = 4 - \sqrt{0} = 4.$$

So $x = 4$ is a solution.

When $x = 8$, the left hand side of the equation equals

$$4 - \sqrt{4 \cdot 8 - 16} = 4 - \sqrt{4^2} = 4 - 4 = 0 \neq 4.$$

So $x = 8$ is not a solution.

Therefore, the equation has only one solution $x = 4$.

54. ../Individual-Questions-by-Topics/Rat-Rad-Functions/Domain-Rational-Function-I-001.tex

Find the domain of the following rational function and write your answer in interval notation

$$f(x) = \frac{4x^2}{x+1}$$

**Solution:** The rational function is well-defined if $x + 1 \neq 0$, equiavlently, $x \neq -1$. In interval notation, the domain is

$$(-\infty, -1) \cup (-1, \infty).$$

55. ../Individual-Questions-by-Topics/Rat-Rad-Functions/Domain-Rational-Function-I-002.tex

Find the domain of the following rational function and write your answer in interval notation

$$f(x) = \frac{-2x^2}{x^2 + 11x}$$

**Solution:** The rational function is well-defined except the values of $x$ such that $x^2 + 11x = 0$. Since the equation has two solutions $x = 0$ or $x = -11$. Removing the two numbers from the number line, we find the domain of the function $f$ is

$$(-\infty, -11) \cup (-11, 0) \cup (0, \infty).$$

56. ../Individual-Questions-by-Topics/Rat-Rad-Functions/Domain-Radical-Function-I-001.tex

    Find the domain of the following rational function and write your answer in interval notation

$$f(x) = \sqrt{-x-7}$$

> **Solution:** The rational function is well-defined if $-x-7 \geq 0$, equiavlently, $x \leq -7$. In interval notation, the domain is
> $$(-\infty, -7].$$

57. ../Individual-Questions-by-Topics/Rat-Rad-Functions/Domain-Radical-Function-I-002.tex

    Find the domain of the following rational function and write your answer in interval notation

$$f(x) = \sqrt{x^2+6}$$

> **Solution:** The rational function is well-defined if $x^2+7 \geq 0$. Since the $x^2 \geq 0$ for all real numbers. Then the domain of this function is the set of real numbers. In interval notation, the domain is
> $$(-\infty, \infty).$$

58. ../Individual-Questions-by-Topics/Rat-Rad-Functions/Domain-Rational-Radical-Function-I-001.tex

    Find the domain of the following rational function and write your answer in interval notation

$$f(x) = \frac{-3x^3}{\sqrt{-x-3}}$$

> **Solution:** The function is well-defined if the denominator $\sqrt{-x-3}$ is a nonzero real number. Since the denominator is a radical, and cannot be zero, we know $x$ must satisfy the inequality $-x-3 > 0$. Solve the inequality, we get $x < -3$. So the domain of $f$ is
> $$(-\infty, -3).$$

59. ../Individual-Questions-by-Topics/Quadratic/Completing-Square-I-001.tex

    Write the following quadratice polynomial in the form $a(y-h)^2+k$ form

$$y^2+6y-4.$$

**Solution:**

$$y^2 + 6y - 4 = (y^2 + 6y) - 4 = (y + 3)^2 - 3^2 - 4 = (y + 3)^2 - 13.$$

60. ../Individual-Questions-by-Topics/Quadratic/Completing-Square-I-002.tex

    Write the following quadratice polynomial in the form $a(y - h)^2 + k$ form

    $$3y^2 + 6y - 2.$$

**Solution:**

$$3y^2 + 6y - 2 = 3(y^2 + 2y) - 2 = 3(y + 1)^2 - 3 \cdot 1^2 - 2 = 3(y + 1)^2 - 5.$$

61. ../Individual-Questions-by-Topics/Quadratic/Solve-by-Completing-Square-I-001.tex

    Solve the following equation **by completing the square**

    $$3y^2 + 6y - 1 = 0.$$

**Solution:**

$$\begin{aligned} 3y^2 + 6y - 1 &= 0 \\ 3(y + 1)^2 - 4 &= 0 \\ (y + 1)^2 &= \frac{4}{3} \\ y + 1 &= \pm\sqrt{\frac{4}{3}} \\ y &= -1 \pm \frac{\sqrt{12}}{3}. \end{aligned}$$

62. ../Individual-Questions-by-Topics/Quadratic/Solve-by-Completing-Square-I-002.tex

    Solve the following equation **by completing the square**

    $$y^2 - 6y + 11 = 0.$$

    *Note: No credit for using methods other than completing the square.*

**Solution:**

$$\begin{aligned} y^2 - 6y + 11 &= 0 \\ (y-3)^2 + 2 &= 0 \\ (y-3)^2 &= -2 \\ y - 3 &= \pm\sqrt{-2} \\ y &= 3 \pm \mathbf{i}\sqrt{2}. \end{aligned}$$

63. ../Individual-Questions-by-Topics/Quadratic/Solve-by-Quadratic-Formula-I-001.tex

Solve the following equation

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

**Solution:** Since $a = -3$ and $b = 5$ and $c = 2$, the equation has to two solution

$$y = \frac{-5 \pm \sqrt{5^2 - 4 \cdot (-3) \cdot 2}}{2 \cdot (-3)} = \frac{-5 \pm \sqrt{49}}{-6}.$$

64. ../Individual-Questions-by-Topics/Quadratic/Quadratic-Formula-Application-I-001.tex

A rectangle whose length is 3 meters longer than its width has an area 5 square meters. What is the dimension of the rectangle? Round your answer to the nearest tenth of a meter.

**Solution:** Suppose the width is $x$ meters. Then the length is $x + 3$. By the rectangular area formula: $Area = Width \times Length$, we have the following equation

$$x(x+3) = 5.$$

Simplify the equation, we get

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

By the quadratic formula, we get

$$x = \frac{-3 + \sqrt{29}}{2}$$

So the width is approximately 1.2 meters and the length is approximately 4.2 meters.

65. ../Individual-Questions-by-Topics/Quadratic/Quadratic-Formula-Application-I-002.tex

The hypotenuse of a **right triangle** is 6 feet long. One leg is 2 feet longer than the other. Find the length of each leg to the nearest tenth of a foot.

**Solution:** Suppose the shorter leg is $x$ feet. Then the longer leg is is $x+2$. By Pythagorean Theorem, we have the following equation

$$x^2 + (x+2)^2 = 6^2.$$

Simplify the equation, we get

$$x^2 + 2x - 16 = 0.$$

By the quadratic formula, we get

$$x = -1 + \sqrt{17}.$$

So the legs are approximately 3.1 feet and 5.1 feet.

66. ../Individual-Questions-by-Topics/Quadratic/Quadratic-Formula-Application-I-003.tex

A rectangle whose length is 3 meters less than twice its width has an area 75 square meters. What is the length of the diagonal? Round your answer to the nearest thousandth of a meter.

**Solution:** Suppose the width is $x$ meters. Then the length is $2x - 3$ meters. By the rectangular area formula: Area = Width $\times$ Length, we have the following equation

$$x(2x-3) = 75.$$

Simplify the equation, we get

$$2x^2 - 3x - 75 = 0.$$

By the quadratic formula, we get

$$x = \frac{-3 + \sqrt{(-3)^2 - 4 \cdot 2 \cdot (-75)}}{2 \cdot 2} = \frac{-3 + \sqrt{609}}{4}.$$

So the width is approximately $\frac{-3+\sqrt{609}}{4}$ meters and the length is $\frac{\sqrt{609}-9}{2}$ meters. The diagonal is

$$\sqrt{\left(\frac{-3+\sqrt{609}}{4}\right)^2 + \left(\frac{\sqrt{609}-9}{2}\right)^2} \approx 12.859$$

meters.

67. ../Individual-Questions-by-Topics/Quadratic/Quadratic-Formula-Application-I-004.tex

The hypotenuse of an isosceles right triangle is 8cm longer than either of its legs. Note that an isosceles right triangle is a right triangle whose legs are the same length. Find the exact length of its legs and its hypotenuse.

**Solution:** Suppose the length of a leg is $x$ meters. Then the length of the hypotenuse is $x + 8$. By Pythagorean identity: hypotenuse$^2$ = Leg$^2$ + Leg$^2$, we have the following equation

$$x^2 + x^2 = (x + 8)^2.$$

Simplify the equation, we get

$$x^2 - 16x - 64 = 0.$$

By the quadratic formula, we get

$$x = \frac{-(-16) + \sqrt{(-16)^2 - 4 \cdot (-64)}}{2} = 8 + 8\sqrt{2}.$$

So the leg is $8 + 8\sqrt{2}$ cm and the hypotenuse is $16 + 8\sqrt{2}$ cm.

68. ../Individual-Questions-by-Topics/Quadratic/Graph-Quadratic-Function-I-001.tex

Consider the parabola of the function on the right.

(1). For what values of $x$ is $y$ negative? Express your answer in interval notation.

(2). Find the domain of the function.

(3). Find the range of the function.

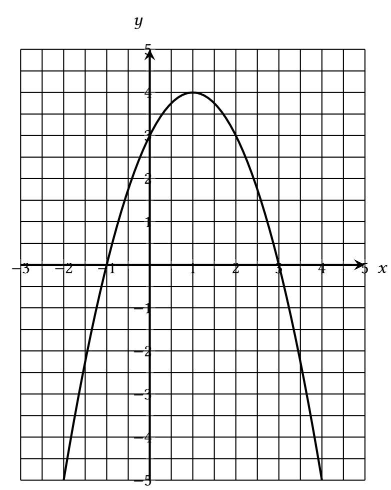
(4). Determine the value of $f(0)$.

(5). Determine the coordinates of the $x$-intercepts.

(6). Determine the coordinate of the $y$-intercept.

(7). Determine the coordinate of the vertex.

(8). For what value of $x$ is $f(x) = 3$




**Solution:**
(1) $(-1, 3)$. (2) $(-\infty, \infty)$. (3) $(-\infty, 4]$ (4) $f(0) = 3$.
(5) $(-1, 0)$ and $(3, 0)$. (6) $(0, 3)$. (7) $(1, 4)$. (8) $x = 0$ or $x = 2$.

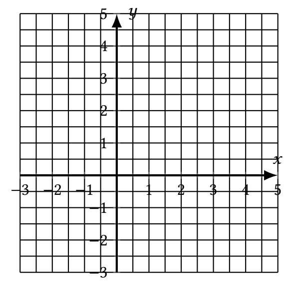
69. ../Individual-Questions-by-Topics/Quadratic/Graph-Quadratic-Function-I-002.tex

Consider the quadratic function

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

(1) Determine the coordinates of the $x$-intercepts, the coordinate of the $y$-intercept, the axis of symmetry and the coordinate of the vertex.

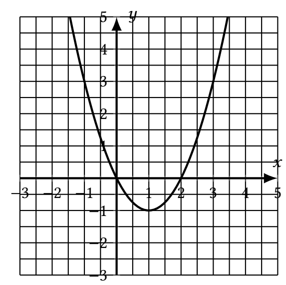
(2) Sketch the graph of the quadratic function using the information in part A.



**Solution:**

(1) The line of symmetry is $x = 1$. The $x$-intercepts are $(0, 0)$ and $(2, 0)$. The $y$-intercept is $(0, 0)$. The vertex is $(1, -1)$.

(2) The graph of $f$ is shown in the right.



70. ../Individual-Questions-by-Topics/Quadratic/Graph-Quadratic-Function-I-003.tex

Consider the quadratic function

$$f(x) = -x^2 + 6x - 5.$$

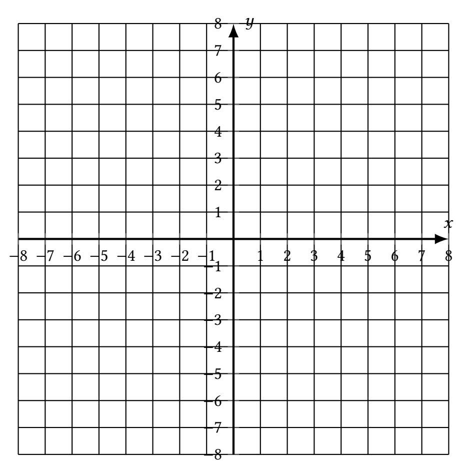
(1) Find the line of symmetry.

(2) Find the coordinate of the vertex.

(3) Find the coordinate of the $y$-intercept.

(4) Find the coordinates of the $x$-intercepts.

(5) Sketch the graph of the quadratic function.



**Solution:**

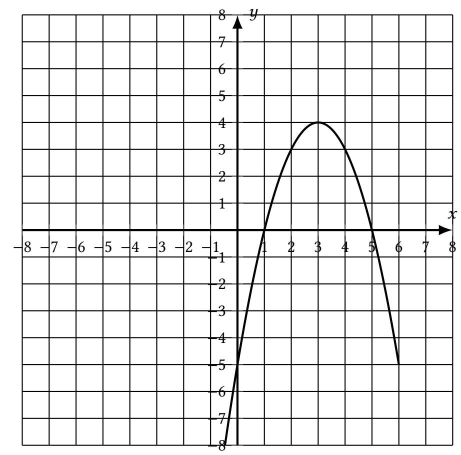
(1) The line of symmetry is $x = 3$.

(2) The vertex is $(3, 4)$.

(3) The $y$-intercept is $(0, -5)$.

(4) The $x$-intercepts are $(1, 0)$ and $(5, 0)$.

(5) The graph of $f$ is shown in the right.




71. ../Individual-Questions-by-Topics/Quadratic/Quadratic-Function-I-001.tex

A quadratic function has its vertex at the point $(-5, -1)$. The function passes through the point $(4, 2)$. When written in vertex form, the function is $f(x) = a(x-h)^2 + k$. Find the $a$, $h$ and $k$.

**Solution:** Since the vertex is $(-5, -1)$, we know that $h = -5$ and $k = -1$. To find $a$, we plug the point $(4, 2)$ in the equation and solve for $a$.

$$\begin{aligned} 2 &= a(4-(-5))^2 + (-1) \\ 2-(-1) &= a(4-(-5))^2 \\ 3 &= 81a \\ a &= \frac{1}{27}. \end{aligned}$$

72. ../Individual-Questions-by-Topics/Exp-Log-Equations/Investment-Exponential-Function-I-001.tex

A 5000 check was deposited to a bank account with the annual rate 5% compounded monthly. Using the formula:

$$A = P\left(1 + \frac{r}{n}\right)^{nt},$$

(1) determine the account balance after 6 years. Round your answer to the nearest cent;

(2) determine how many years, to the nearest tenth, it will take double the account.

**Solution:**

(1)

$$A = 5000\left(1 + \frac{0.05}{12}\right)^{12\cdot 6} \approx 6745.09$$

(2) Solve $t$ from the equation

$$\begin{aligned} 10000 &= 5000\left(1 + \frac{0.05}{12}\right)^{12t} \\ 2 &= \left(1 + \frac{0.05}{12}\right)^{12t} \\ \ln 2 &= 12t \ln\left(1 + \frac{0.05}{12}\right) \\ t &= \frac{\ln 2}{12 \ln\left(1 + \frac{0.05}{12}\right)} \\ t &\approx 13.9 \end{aligned}$$

73. ../Individual-Questions-by-Topics/Exp-Log-Equations/Investment-Exponential-Function-I-002.tex

Use the formula $A = P \cdot e^{rt}$ to find the balance of an investment \$3000 at 5% compounded continuously after 7 years. Round your answer to nearst dollars.

**Solution:**

$$A(7) = 3000e^{0.04999\cdot 7} \approx 4256.$$

74. ../Individual-Questions-by-Topics/Exp-Log-Equations/Exponential-Equation-I-001.tex

Solve the exponential equation $2^{2x+1} = 18$. Round your result to the nearest thousandth.

**Solution:**

$$\begin{aligned} 2^{2x+1} &= 18 \\ 2x + 1 &= \log_2(18) \\ 2x &= \log_2(18) - 1 \\ x &= \frac{1}{2}(\log_2(18) - 1) \approx 1.585 \end{aligned}$$

75. ../Individual-Questions-by-Topics/Exp-Log-Equations/Exponential-Equation-I-002.tex

Solve the exponential equation $2 \cdot 10^x - 4 = 2$. Round your result to the nearest hundredth.

**Solution:**

$$\begin{aligned} 2 \cdot 10^x - 4 &= 2 \\ 2 \cdot 10^x &= 6 \\ 10^x &= 3 \\ x &= \log 3 \approx 0.48 \end{aligned}$$

76. ../Individual-Questions-by-Topics/Exp-Log-Equations/Solve-log-equation-I-001.tex

Solve the logarithmic equation

$$\log(2x + 13) - \log x = 1.$$

**Solution:**

$$\begin{aligned} \log(2x + 13) - \log x &= 1 \\ \log(\frac{2x + 13}{x}) &= 1 \\ \frac{2x + 13}{x} &= 10^1 \\ 2x + 13 &= 10x \\ 8x &= 13 \\ x &= \frac{13}{8}. \end{aligned}$$

77. ../Individual-Questions-by-Topics/Exp-Log-Equations/Solve-log-equation-I-002.tex

Solve the following equations for $x$.

$$\log_7 x + \log_7(x - 6) = 1.$$

**Solution:**

$$\begin{aligned} \log_7 x + \log_7(x-6) &= 1 \\ \log_7(x(x-6)) &= 1 \\ x(x-6) &= 7 \\ x^2 - 6x - 7 &= 0 \\ (x+1)(x-7) &= 0 \end{aligned}$$

$$\begin{aligned} x+1 &= 0 \quad &\text{or}& \quad & x-7 &= 0 \\ x &= -1 \quad &\text{or}& \quad & x &= 7 \end{aligned}$$

Since in $\log_7 x$, $x$ must be positive. So $x = -1$ cannot be a solution. Plug in $x = 5$ and check:

$$\log_7 7 + \log_7(7-6) = 1 + \log_7 1 = 1 + 0 = 1.$$

So the solution is $x = 5$.

78. ../Individual-Questions-by-Topics/Exp-Log-Equations/Solve-log-equation-I-003.tex

Solve the logarithmic equation

$$\log_3 \sqrt{x-6} = 1.$$

**Solution:**

$$\begin{aligned} \log_3 \sqrt{x-6} &= 1 \\ \sqrt{x-6} &= 3 \\ x - 6 &= 3^2 \\ x &= 15. \end{aligned}$$

79. ../Individual-Questions-by-Topics/Exp-Log-Equations/Solve-log-equation-I-004.tex

Solve the logarithmic equation

$$\log(9 - 7x) = 1 + \log(-x).$$

**Solution:**

$$\begin{aligned}
\log(9-7x) &= 1+\log(-x)\\
\log(9-7x)-\log(-x) &= 1\\
\log\left(\frac{9-7x}{-x}\right) &= 1\\
\frac{9-7x}{-x} &= 10^1\\
\frac{9-7x}{-x} &= 10\\
9-7x &= -10x\\
9 &= -3x\\
x &= -3.
\end{aligned}$$

Check: The left hand side is

$$\log(9-7\cdot(-3)) = \log(3\cdot 10) = \log 3 + 1$$

which is the same as right hand side. So the solution is $x = -3$.

80. ../Individual-Questions-by-Topics/Exp-Log-Equations/Solve-log-equation-I-005.tex

Solve the logarithmic equation

$$\log_x 9 = 2$$

**Solution:**

$$\begin{aligned}
\log_x 9 &= 2\\
x^2 &= 9\\
x &= \sqrt{9} = 3
\end{aligned}$$

81. ../Individual-Questions-by-Topics/Exp-Log-Equations/Domain-Log-Function-I-001.tex

Find the domain of the function $f(x) = \log_{22}(x-19)$. Write the domain in interval notation.

**Solution:** To get real numbers as output, the power $x-19$ must be positive. Solve the inequality $x-19>0$, we find that $x>19$ and domain of the function $f$ is $(19,\infty)$.