

## Test 1

This test is graded out of 50 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

**Question 1.** (2 marks) 5 is 20% of what number?

$$\begin{aligned} \text{Percentage} &= \text{Base (rate)} \\ 5 &= \text{Base (0.2)} \\ 25 &= \text{Base} \end{aligned}$$

**Question 2.** (1 mark each) Simplify and write all answer without using exponents and decimals:

a.

$$(-2)^3 = -8$$

b.

$$\left(\frac{2}{-9}\right)^2 = \frac{(2)^2}{(-9)^2} = \frac{4}{81}$$

c.

$$\left(\frac{3}{-2}\right)^{-2} = \left(\frac{-2}{3}\right)^2 = \frac{(-2)^2}{3^2} = \frac{4}{9}$$

d.

$$(xy^2)^0 = 1$$

**Question 3.** (2 marks each) Simplify and write all answers so that only positive exponents remain:

a.

$$\left(\frac{a}{a^{-4}}\right)^2 = \frac{a^2}{(a^{-4})^2} = \frac{a^2}{a^{-8}} = a^2 a^8 = a^{10}$$

b.

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

**Question 4.** (5 marks) Simplify and write the solution so that only positive exponents remain:

$$\begin{aligned}\left(\frac{x^{-2}y^3z^1}{-x^3y^{-2}z^0}\right)^{-2} &= \left(\frac{-x^3y^{-2}}{x^2y^3z}\right)^2 \\ &= \frac{(-1)^2(x^3)^2(y^{-2})^2}{(x^2)^2(y^3)^2z^2} \\ &= \frac{x^6y^{-4}}{x^4y^6z^2} \\ &= \frac{x^6x^4}{y^4y^6z^2} \\ &= \frac{x^{10}}{y^{10}z^2}\end{aligned}$$

**Question 5.** (3 marks) Simplify:

$$\begin{aligned}-[8-4(x+5)+x]-(x-1) &= -[8-4x-20+x]-x+1 \\ &= -[-12-3x]-x+1 \\ &= 12+3x-x+1 \\ &= 13+2x\end{aligned}$$

**Question 6.** (2 marks) Expand and simplify:

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

Question 7. (4 marks) Expand and simplify:

$$\begin{aligned} & (x+2)(x-3) - (x+3)^2 - 13 \\ = & x^2 + 2x - 3x - 6 - [(x+3)(x+3)] - 13 \\ = & x^2 - x - 6 - [x^2 + 6x + 9] - 13 \\ = & x^2 - x - 6 - x^2 - 6x - 9 - 13 \\ = & -7x - 28 \end{aligned}$$

Question 8. (4 marks) Divide using long division:

$$(x^3 + 2x^2 - 1) \div (x+1)$$

$$\begin{array}{r} x^2 + x - 1 \\ x+1 \overline{) x^3 + 2x^2 + 0x - 1} \\ \underline{-(x^3 + x^2)} \phantom{- 1} \\ x^2 + 0x \phantom{- 1} \\ \underline{-(x^2 + x)} \phantom{- 1} \\ -x - 1 \phantom{- 1} \\ \underline{-(-x - 1)} \\ -1 \end{array}$$

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

Question 9. (2 marks) Factor completely:

$$\begin{aligned} 12x^2 + 11x + 2 &= 12x^2 + 3x + 8x + 2 \\ &= 3x(4x + 1) + 2(4x + 1) \\ &= (4x + 1)(3x + 2) \end{aligned}$$

$$\begin{aligned} 12x^2(2) &= 24x^2 = ab \\ \text{s.t. } a + b &= 11x \\ 3x + 8x &= 11x \end{aligned}$$

Question 10. (4 marks) Simplify completely:

$$\begin{aligned} & \frac{x^2-11}{x^2+7x+6} - \frac{x}{x+6} + \frac{2}{x+1} \\ &= \frac{x^2-11}{(x+1)(x+6)} - \frac{x}{x+6} + \frac{2}{x+1} \quad \text{LCD} = (x+1)(x+6) \\ &= \frac{x^2-11}{(x+1)(x+6)} - \frac{x(x+1)}{(x+6)(x+1)} + \frac{2(x+6)}{(x+1)(x+6)} \\ &= \frac{x^2-11 - x^2-x + 2x + 12}{(x+1)(x+6)} \\ &= \frac{x+1}{(x+1)(x+6)} \\ &= \frac{1}{x+6} \end{aligned}$$

Question 11. (6 marks) Simplify completely:

$$\begin{aligned} & \frac{x^2+5x}{x^2-25} \times \frac{x^2-x-20}{3x+12} \div \frac{x^2+3x}{3x^2-27} \\ &= \frac{x(x+5)}{\cancel{(x-5)}(x+5)} \cdot \frac{\cancel{(x-5)}(x+4)}{3(x+4)} \cdot \frac{3(x^2-9)}{x(x+3)} \\ &= \frac{(x-3)(x+3)}{\cancel{(x+3)}} \\ &= (x-3) \end{aligned}$$

Question 12. (2 marks) Solve for x:

$$\begin{aligned}5(x-6) &= -2(15-2x) \\5x-30 &= -30+4x \\5x-4x &= -30+30 \\x &= 0\end{aligned}$$

Question 13. (3 marks) Solve for x:

$$\frac{4x+1}{2} - \frac{2x+3}{3} = \frac{5x-1}{4}$$

$$\text{LCD} = 12$$

$$\begin{aligned}\frac{(4x+1)(12)^6}{2} - \frac{(2x+3)(12)^4}{3} &= \frac{(5x-1)(12)^3}{4} \\6(4x+1) - 4(2x+3) &= 3(5x-1) \\24x+6 - 8x-12 &= 15x-3 \\24x-8x-15x &= 12-3-6 \\x &= 3\end{aligned}$$

Question 14. (5 marks) Solve for x:

$$\frac{7}{x^2-x-6} - \frac{2}{x-3} = \frac{1}{x+2}$$

$$\frac{7}{(x-3)(x+2)} - \frac{2}{(x-3)} = \frac{1}{x+2}$$

$$\text{LCD} = (x-3)(x+2)$$

$$\frac{7(x-3)(x+2)}{(x-3)(x+2)} - \frac{2(x-3)(x+2)}{(x-3)} = \frac{1(x-3)(x+2)}{x+2}$$

Does  $x=2$  make any denominator zero? no.

$$7 - 2(x+2) = x-3$$

$$7 - 2x - 4 = x - 3$$

$$7 - 4 + 3 = x + 2x$$

$$6 = 3x$$

$$2 = x$$