

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) 45 is 20% of what number?

$$\begin{aligned} \text{Percentage} &= \text{Base (rate)} \\ 45 &= \text{Base (0.20)} \\ 225 &= \text{Base} \end{aligned}$$

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

a.

$$-(-2)^5 = -(-32) = 32$$

b.

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

c.

$$\left(\frac{3}{-5}\right)^3 = \frac{(3)^3}{(-5)^3} = \frac{-27}{125}$$

d.

$$-(256z)^0 = -1$$

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

a.

$$\left(\frac{b^{-2}}{b}\right)^{-2} = \left(\frac{b}{b^{-2}}\right)^2 = \frac{b^2}{b^{-4}} = b^2 b^4 = b^6$$

b.

$$-\left(\frac{-x}{3}\right)^4 = -\frac{(-x)^4}{3^4} = \frac{-x^4}{81}$$

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:

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

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

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

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:

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

Question 11. (6 marks) Simplify completely:

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

Question 12. (2 marks) Solve for x:

$$5(x-6) = -2(15-2x)$$

$$5x - 30 = -30 + 4x$$

$$5x - 4x = -30 + 30$$

$$x = 0$$

Question 13. (3 marks) Solve for x:

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

$$\text{LCD} = 12$$

$$\frac{(4x+1)(12)^6}{2} - \frac{(2x+3)(12)^4}{3} = \frac{(5x-1)(12)^3}{4}$$

$$6(4x+1) - 4(2x+3) = 3(5x-1)$$

$$24x + 6 - 8x - 12 = 15x - 3$$

$$24x - 8x - 15x = 12 - 3 - 6$$

$$x = 3$$

Question 14. (5 marks) Solve for x:

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

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

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

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

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

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

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

$$6 = 3x$$

$$2 = x$$

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