

Name: SOLUTIONS

**TEST 1 - Version 2**  
**201-009-DW**  
**Functions & Trigonometry**  
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**Question 1 (11 marks)**

Simplify the following expressions.

(Note that your answers should be expressed using only positive exponents).

(a) (2 marks)  $(-3m^2n^3)(-2m^{-2}n^{-4})$

$$6m^0n^{-1} = \boxed{\frac{6}{n}}$$

(b) (3 marks)

$$\frac{(3ab^{-3})^{-2}}{(2a^{-2}b^4)^{-3}} = \frac{3^{-2}a^{-2}b^6}{2^{-3}a^6b^{-12}} = \frac{2^3b^{18}}{3^2a^8} = \boxed{\frac{8b^{18}}{9a^8}}$$

(c) (3 marks)

$$\frac{(x^{-3}y^2)^{-2}(xy)^{-4}}{(x^{-2}y^3)^{-4}} = \frac{x^6y^{-4}x^{-4}y^{-4}}{x^8y^{-12}} = \frac{x^2y^{-8}}{x^8y^{-12}} = \boxed{\frac{y^4}{x^6}}$$

(d) (3 marks)

$$\frac{x^0y^{-2}z^3}{(xy^{-1}z^{-3})^{-1}} = \frac{y^{-2}z^3}{x^{-1}y^1z^3} = \boxed{\frac{x}{y^3}}$$

**Question 2 (15 marks)**

Solve the following equations.

(a) (1 mark)  $2(x-3) = x-12$

$2x-6 = x-12$

$x = -6$

(b) (2 marks)  $x^2 - 5x - 36 = 0$

$(x-9)(x+4) = 0$

$x = 9$  OR  $x = -4$

(c) (3 marks)  $18x^2 - 9x - 5 = 0$

① FACTORING

$a \cdot b = 90$

$a+b = -9 \quad -15, 6$

$18x^2 + 6x - 15x - 5 = 0$

$6x(3x+1) - 5(3x+1) = 0$

$(3x+1)(6x-5) = 0$

$3x+1=0$

$x = -1/3$

OR

$6x-5=0$

$x = 5/6$

(d) (2 marks)  $2x^2 = -x-2$

$2x^2 + x + 2 = 0$

discrimi. =  $b^2 - 4ac$

$= 1 - 4(2)(2)$

 $= -15$  the discriminant is negative  
There are NO SOLUTIONS

② QUADRATIC FORMULA

$x = \frac{9 \pm \sqrt{(-9)^2 - 4(18)(-5)}}{2(18)}$

$= \frac{9 \pm \sqrt{81 + 360}}{36}$

$= \frac{9 \pm 21}{36} \quad x = \frac{30}{36} = 5/6$

OR  $x = \frac{-12}{36} = -1/3$

(e) (3 marks)  $2x^3 - x^2 - 6x = 0$

$$\begin{aligned}x(2x^2 - x - 6) &= 0 & a \cdot b &= -12 \\x(2x^2 - 4x + 3x - 6) &= 0 & a + b &= -1 \\x(2x(x-2) + 3(x-2)) &= 0 & & -4, 3 \\x(x-2)(2x+3) &= 0\end{aligned}$$

$$\boxed{x=0} \quad \text{OR} \quad \boxed{x=2} \quad \text{OR} \quad \boxed{x=-3/2}$$

(f) (2 marks)  $x^2 = -10x + 11$

$$\begin{aligned}x^2 + 10x - 11 &= 0 \\(x+11)(x-1) &= 0\end{aligned}$$

$$\boxed{x=-11} \quad \text{OR} \quad \boxed{x=1}$$

(g) (2 marks)  $2[2(x-1)+7] = 11 - (x+5)$

$$2[2x+5] = 11 - x - 5$$

$$4x + 10 = 6 - x$$

$$5x = -4$$

$$\boxed{x = -4/5}$$

**Question 3** (3 marks)

Multiply and simplify.

$$\begin{aligned}5a^3(4a+2)^2 &= 5a^3(4a+2)(4a+2) \\&= 5a^3(16a^2+16a+4) \\&= \boxed{80a^5 + 80a^4 + 20a^3}\end{aligned}$$

**Question 4** (5 marks)Perform the following division:  $(x^4 + 5x^2 - 4x + 3) \div (x - 1)$ 

(Express your answer in one of the two ways shown in class)

$$\begin{array}{r}
 x^3 + x^2 + 6x + 2 \\
 x-1 \overline{) x^4 + 5x^2 - 4x + 3} \\
 \underline{-(x^4 - x^3)} \phantom{+ 3} \\
 x^3 + 5x^2 - 4x + 3 \\
 \underline{-(x^3 - x^2)} \phantom{- 4x + 3} \\
 6x^2 - 4x + 3 \\
 \underline{-(6x^2 - 6x)} \phantom{+ 3} \\
 2x + 3 \\
 \underline{-(2x - 2)} \\
 5
 \end{array}$$

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

**Question 5** (6 marks)

Simplify.

$$\frac{2x^2 - x}{4x^2 - 1} \div \frac{3x}{4x^2 + 4x + 1} \cdot \frac{6x^2 - 6x}{4x^2 - 2x - 2}$$

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

$$= \frac{x(2x+1) \cdot 6x(x-1)}{3x \cdot 2(2x+1)(x-1)}$$

$$= \boxed{x}$$

**Question 6** (6 marks)

Add/subtract and simplify.

(a) (4 marks) 
$$\frac{x}{3-x} + \frac{4}{x^2-9}$$

$$= \frac{-x}{x-3} + \frac{4}{(x+3)(x-3)}$$

$$= -\frac{x(x+3)}{(x-3)(x+3)} + \frac{4}{(x+3)(x-3)}$$

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

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

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

**Question 7** (4 marks)The polynomial  $x^5 - 3x^4 - 10x^3 + 30x^2 + 9x - 27$  has five factors. One of them is  $(x-3)$ . Find the other 4 factors.SINCE  $x-3$  IS A FACTOR THEN IT WILL DIVIDE THE POLYNOMIAL

$$x-3 \overline{) x^5 - 3x^4 - 10x^3 + 30x^2 + 9x - 27}$$

By long division you get  $x^4 - 9x^2 + 10$  WHICH FACTORS like a quadratic

$$\begin{aligned} & x^4 - 9x^2 + 10 \\ &= (x^2 - 9)(x^2 - 1) \\ &= (x+3)(x-3)(x+1)(x-1) \end{aligned}$$

THESE ARE THE OTHER FOUR FACTORS.