

#1.) Simplify each rational expression and state the non-permissible values. (2marks each)

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a) $\frac{6x^2 - x - 1}{9x^2 - 1}$

NPV'S
 $3x \pm 1 \neq 0$
 $3x + 1$
 $x \neq \pm \frac{1}{3}$
 $x \neq \pm \frac{1}{3}$

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

$$= \frac{2x-1}{3x-1}; x \neq \pm \frac{1}{3}$$

b) $\frac{5-x}{x-5}$

NPV
 $x \neq 5$

$$= -1 \frac{(x-5)}{(x-5)}$$

$$= -1; x \neq 5$$

c) $\frac{-6r^2 p^3}{4rp^4}$

$$= -\frac{6r^2 p^3}{24r p^4}$$

$$= -\frac{3r}{2p}; r \neq 0, p \neq 0$$

#2.) Simplify each product. Identify all non-permissible values.

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a) $\frac{63a^2 b^3}{-8b^2} \times \frac{4a^4 b^2}{9a^2}$ (2marks)

$$= \frac{7a^2 b^3 a^4 b^2}{-2b^2 a^2}$$

$$= -\frac{7a^4 b^3}{2}; a \neq 0, b \neq 0$$

b) $\frac{y^2 - 9y + 8}{y^2 - 1} \div \frac{5-y}{y^2 - 25}$ (3marks)

NPV'S
 $y \neq \pm 1, \pm 5$

$$= \frac{(y-8)(y-1)}{(y-1)(y+1)} \div \frac{5-y}{(y+5)(y-5)}$$

$$= \frac{(y-8)}{(y+1)} \cdot \frac{(y+5)(y-5)}{-1(y-5)}$$

$$= -1 \frac{(y-8)(y+5)}{y+1}; y \neq \pm 1, \pm 5$$

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c) $\frac{2p^2 + 5p - 3}{2p - 3} \times \frac{p^2 - 1}{6p - 3} \times \frac{2p - 3}{p^2 + 2p - 3}$ (3 marks)

$$= \frac{(2p-1)(p+3)}{2p-3} \times \frac{(p-1)(p+1)}{3(2p-1)} \times \frac{2p-3}{(p+3)(p-1)}$$

$$= \frac{p+1}{3}; p \neq \frac{1}{2}, \frac{3}{2}, 3, 1$$

d) $\left(\frac{3x+12}{3x^2-5x-12}\right) \left(\frac{x-3}{x+4}\right) \div \frac{15}{3x+4}$ (4marks)

$$= \frac{3(x+4)}{(3x+4)(x-3)} \cdot \frac{(x-3)}{(x+4)} \div \frac{15}{3x+4}$$

$$= \frac{3}{3x+4} \cdot \frac{3x+4}{15}$$

$$= \frac{1}{5}; x \neq -4, -\frac{4}{3}$$

#3) Simplify. Express answers in simplest form. Identify all non-permissible values.

a) $\frac{x-2}{3} - \frac{x+1}{3}$ (1 mark)

$\frac{3}{3}$

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

$$= \frac{x-2-x-1}{3}$$

$$= \frac{-3}{3} = -1$$

c) $\frac{2w}{w^2+5w+6} - \frac{w-6}{w^2+6w+8}$ (4 marks)

$\frac{8}{8}$

NPV's
 $w \neq -2, -3, -4$

$$= \frac{2w}{(w+2)(w+3)} - \frac{w-6}{(w+4)(w+2)}$$

$$= \frac{2w \cdot (w+4)}{(w+2)(w+3)(w+4)} - \frac{w-6 \cdot (w+3)}{(w+4)(w+2) \cdot (w+3)}$$

$$= \frac{2w^2+8w - (w^2-3w-18)}{(w+2)(w+3)(w+4)}$$

$$= \frac{2w^2+8w - w^2+3w+18}{(w+2)(w+3)(w+4)}$$

$$= \frac{w^2+11w+18}{(w+2)(w+3)(w+4)}$$

$$= \frac{(w+2)(w+9)}{(w+2)(w+3)(w+4)}$$

$$= \frac{w+9}{(w+3)(w+4)} ; w \neq -2, -3, -4$$

b) $\frac{4}{5x} + \frac{3}{10x}$ (2 marks)

$$= \frac{8}{10x} + \frac{3}{10x}$$

$$= \frac{11}{10x} ; x \neq 0$$

d) $\frac{2}{x^2+x-6} + \frac{3}{x^3+2x^2-3x}$ (4 marks)

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

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

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

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

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

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

$x \neq 0, -3, 1, 2$

$$e) \frac{\frac{3}{2} + \frac{3}{t}}{t+6} \cdot \frac{1}{t} \quad (5 \text{ marks})$$

$$= \left(\frac{3(t)}{2(t)} + \frac{3(t)}{t(t)} \right) \div \left(\frac{t(t)}{t+6(t)} - \frac{1(t)}{t(t)} \right)$$

$$= \left(\frac{3t+3}{2t} \right) \div \left(\frac{t^2-t-6}{t(t+6)} \right)$$

$$= \frac{3(t+1)}{2t} \div \frac{(t-3)(t+2)}{t(t+6)}$$

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

$$= \frac{3(t+6)}{2(t-3)} ; t \neq 0, -6, 3, -2$$

NPV's
 $x \neq -5, 3, -2, 0$

$$f) \frac{x-2}{x+5} - \frac{x^2-2x-3}{x^2-x-6} \times \frac{x^2+2x}{x^2-4x} \quad (5 \text{ marks})$$

$$= \frac{x-2}{x+5} - \left[\frac{(x-3)(x+1)}{(x-3)(x+2)} \cdot \frac{x(x+2)}{x(x-4)} \right]$$

$$= \frac{(x-4)x-2}{(x-4)(x+5)} - \left[\frac{(x+1)(x+5)}{(x-4)(x+5)} \right]$$

$$= \frac{x^2-6x+8 - (x^2+6x+5)}{(x-4)(x+5)}$$

$$= \frac{x^2-6x+8 - x^2-6x-5}{(x-4)(x+5)}$$

$$= \frac{-12x+3}{(x-4)(x+5)} ; x \neq -5, 3, -2, 0, 4$$

