

Last Name: SOLUTIONS

First Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

## Quiz 1 (A)

Question 1. (3 marks) Simplify the expression (express your answer with positive exponents only):

$$\begin{aligned} \left(\frac{x^3}{-27y^{-6}}\right)^{-2/3} &= \frac{(x^3)^{-2/3}}{(-27)^{-2/3} (y^{-6})^{-2/3}} = \frac{x^{-2}}{(-27)^{-2/3} y^4} \\ &= \frac{(-27)^{2/3}}{x^2 y^4} = \frac{(3\sqrt{-27})^2}{x^2 y^4} = \frac{(-3)^2}{x^2 y^4} = \frac{9}{x^2 y^4} \end{aligned}$$

Question 2. (3 marks) Rationalize the numerator in the expression:

$$\frac{\sqrt[3]{a^2 b}}{c} = \frac{(a^2 b)^{1/3}}{c} \cdot \frac{(a^2 b)^{2/3}}{(a^2 b)^{2/3}} = \frac{a^2 b}{a^{4/3} b^{2/3} c}$$

Question 3. (6 marks) Factor the following completely:

$$\begin{aligned} & \text{(a) } 10x^2 - 23x + 12 \\ &= 10x^2 - 15x - 8x + 12 \\ &= 5x(2x - 3) - 4(2x - 3) \\ &= (2x - 3)(5x - 4) \end{aligned}$$

$$\begin{aligned} \alpha \cdot \beta &= 120 \\ \alpha + \beta &= -23 \\ \alpha &= -15 \quad \beta = -8 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } (x+2)^3 - 8 &= [(x+2)-2] [(x+2)^2 + 2(x+2) + 2^2] \\
 &= x(x^2 + 4x + 4 + 2x + 4 + 4) \\
 &= x(x^2 + 6x + 12)
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } x^3 - 3x^2 - 4x + 12 \\
 &= x^2(x-3) - 4(x-3) \\
 &= (x^2-4)(x-3) \\
 &= (x+2)(x-2)(x-3)
 \end{aligned}$$

**Question 4.** (8 marks) Simplify the following expressions:

$$\text{(a) } \frac{1}{1-\frac{1}{1+x}} + \frac{1}{1-\frac{1}{1-x}} = \frac{1}{\frac{1+x}{1+x} - \frac{1}{1+x}} + \frac{1}{\frac{1-x}{1-x} - \frac{1}{1-x}}$$

$$= \frac{1}{\frac{x}{1+x}} + \frac{1}{\frac{-x}{1-x}} = \frac{1+x}{x} + \frac{1-x}{-x} = \frac{1+x}{x} - \frac{1-x}{x}$$

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

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

$$= \frac{x^2 + a^2}{x} \cdot \frac{x^3}{x^4 - a^4} = \frac{x^2(x^3/a^2)}{(x^2+a^2)(x^2-a^2)} = \frac{x^2}{(x+a)(x-a)}$$