

Last Name: SOLUTIONS

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

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

## Quiz 1 (A)

Question 1. (3 marks) Rationalize the denominator in the expression:

$$\begin{aligned} \sqrt[3]{\frac{2a}{3b}} &= \frac{(2a)^{1/3}}{(3b)^{1/3}} = \frac{(2a)^{1/3}}{(3b)^{1/3}} \cdot \frac{(3b)^{2/3}}{(3b)^{2/3}} = \frac{(2a)^{1/3}(3b)^{2/3}}{3b} \\ &= \frac{\sqrt[3]{2a \cdot 3^2 b^2}}{3b} = \frac{\sqrt[3]{18ab^2}}{3b} \end{aligned}$$

Question 2. (3 marks) Simplify the expression (express your answer with positive exponents only):

$$\left(\frac{a^{-3}}{b^{-2}}\right)^2 \left(\frac{b}{a}\right)^4 = \frac{a^{-6}}{b^{-4}} \cdot \frac{b^4}{a^4} = \frac{b^4 \cdot b^4}{a^6 \cdot a^4} = \frac{b^8}{a^{10}}$$

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

$$\begin{aligned} & \text{(a) } 7x^2 - 27x - 4 \\ &= 7x^2 - 28x + x - 4 \\ &= 7x(x-4) + (x-4) \\ &= (x-4)(7x+1) \end{aligned}$$

$$\begin{aligned} \alpha \cdot \beta &= -28 \\ \alpha + \beta &= -27 \\ \alpha &= -28 \quad \beta = 1 \end{aligned}$$

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

$$\begin{aligned}
 \text{(c) } x^6 - 64 &= (x^3)^2 - 8^2 = (x^3-8)(x^3+8) \\
 &= (x-2)(x^2+2x+4)(x+2)(x^2-2x+4)
 \end{aligned}$$

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

$$\text{(a) } \frac{b-9b^{-1}}{b+4+3b^{-1}} = \frac{b - \frac{9}{b}}{b+4+\frac{3}{b}} = \frac{\frac{b^2}{b} - \frac{9}{b}}{\frac{b^2}{b} + \frac{4b}{b} + \frac{3}{b}}$$

$$= \frac{\frac{b^2-9}{b}}{\frac{b^2+4b+3}{b}} = \frac{b^2-9}{b} \cdot \frac{b}{b^2+4b+3} = \frac{(b+3)(b-3)}{(b+3)(b+1)} = \frac{b-3}{b+1}$$

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

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

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