

King Fahd University of Petroleum and Minerals

Prep-Year Math Program

Math 001 Class Test I
Textbook Sections: P.1 to P.7
Term 181
Time Allowed: 90 Minutes

Student's Name:

ID #:.....

Section:

Serial Number:

Provide neat and complete solutions.

Show all necessary steps for full credit and write the answer in simplest form.

No Calculators, Cameras, or Mobiles are allowed during this exam.

Question	Points	Student's Score
1	4	
2	4	
3	4	
4	4	
5	4	
6	5	
7	4	
8	6	
9	6	
10	6	
11	3	
Total	50	<u> </u> 50
		<u> </u> 100

Q1. (4 points): (P.4 Textbook Exercises 68): Simplify the following expressions. (Assume that all letters denote positive numbers.)

(a): $\left(\frac{x^8 y^{-4}}{16y^{4/3}}\right)^{-1/4}$ (b): $\left(\frac{-8y^{3/4}}{y^3 z^6}\right)^{-1/3}$

Solution:

$$68. (a) \left(\frac{x^8 y^{-4}}{16y^{4/3}}\right)^{-1/4} = 16^{-(-1/4)} x^{8(-1/4)} y^{-4(-1/4)-4/3(-1/4)} = \frac{2y^{4/3}}{x^2}$$

$$(b) \left(\frac{-8y^{3/4}}{y^3 z^6}\right)^{-1/3} = (-8)^{-1/3} y^{3/4(-1/3)-3(-1/3)} z^{-6(-1/3)} = -\frac{y^{3/4} z^2}{2}$$

Q2. (4 points): Simplify $\frac{8^{\frac{1}{3}} \div 2 - 1 - 9 \div 3(2^4 - 1)}{(-2^{-2} + 3^{-1})^{-1}}$

Solution:

$$\frac{8^{\frac{1}{3}} \div 2 - 1 - 9 \div 3(2^4 - 1)}{(-2^{-2} + 3^{-1})^{-1}} = \frac{2 \div 2 - 1 - 9 \div 3(16 - 1)}{\left(-\frac{1}{2^2} + \frac{1}{3}\right)^{-1}}$$

$$= \frac{2 \div 2 - 1 - 9 \div 3(15)}{\left(-\frac{1}{4} + \frac{1}{3}\right)^{-1}}$$

$$= \frac{2 \div 2 - 1 - 9 \div 3(15)}{\left(\frac{-3 + 4}{12}\right)^{-1}}$$

$$= \frac{1 - 1 - 3(15)}{12}$$

$$= \frac{1 - 1 - 45}{12} = \frac{-45}{12}$$

$$= -\frac{15}{4} = -3.75$$

Q3. (4 points): Write without absolute values and simplify. If $-3 < x < -2$ then

$$|-3x| + \sqrt{(x-3)^2} + 2|x+1| = ?$$

Solution:

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

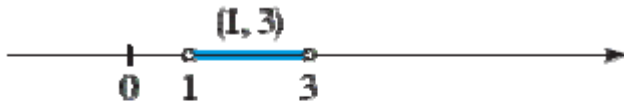
$$= 3(-x) + [-(x-3)] + 2[-(x+1)]$$

$$= -3x - x + 3 - 2x - 2$$

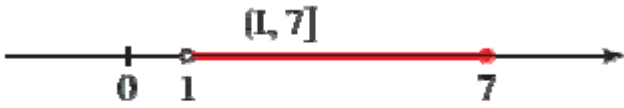
$$= -6x + 1$$

Q4. (4 points): Graph each set and find (a): $(1, 3) \cup [2, 7] = ?$ (b): $(1, 3) \cap [2, 7] = ?$

Solution:

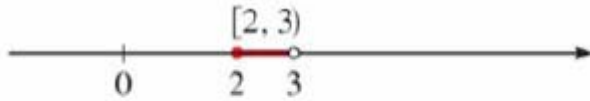


(a):



$$(1, 3) \cup [2, 7] = (1, 7]$$

(b):



$$(1, 3) \cap [2, 7] = [2, 3)$$

Q5. (4 points): Write the number $\frac{(0.021 \times 10^{-5})(160 \times 10^{-3})(0.0005)}{(0.004 \times 10^7)(700 \times 10^{-6})}$ in scientific notation.

Solution:

$$\begin{aligned} \frac{(0.021 \times 10^{-5})(160 \times 10^{-3})(0.0005)}{(0.004 \times 10^7)(700 \times 10^{-6})} &= \frac{(21 \times 10^{-3} \times 10^{-5})(16 \times 10^{-2})(5 \times 10^{-4})}{(4 \times 10^{-3} \times 10^7)(7 \times 10^{-4})} \\ &= \frac{21(16)(5) \times 10^{-14}}{4(7)} \\ &= 12(5) \times 10^{-14} \\ &= 60 \times 10^{-14} \\ &= \boxed{6 \times 10^{-13}} \end{aligned}$$

Q6. (5 points): (P4 Textbook Exercises 30, 37, 38 and 90): Simplify the following expressions.

(a): $\sqrt[3]{8a^5}$ (b): $\sqrt[3]{\sqrt{64x^6}}$ (c): $\sqrt[4]{x^4 y^2 z^2}$ (d): $\frac{1}{\sqrt[4]{x^3}}$ (e): $\frac{1}{\sqrt[3]{x^4}}$

Solution:

(a): $\sqrt[3]{8a^5} = \sqrt[3]{2^3 a^3 a^2} = 2a\sqrt[3]{a^2}$

(b): $\sqrt[3]{\sqrt{64x^6}} = \sqrt[6]{64x^6} = \sqrt[6]{(2x)^6} = 2|x|$

(c): $\sqrt[4]{x^4 y^2 z^2} = \sqrt[4]{x^4} \sqrt[4]{y^2 z^2} = |x| \sqrt[4]{y^2 z^2} = |x| \sqrt{|yz|}$

(d): $\frac{1}{\sqrt[4]{x^3}} = \frac{1}{\sqrt[4]{x^3}} \cdot \frac{\sqrt[4]{x}}{\sqrt[4]{x}} = \frac{\sqrt[4]{x}}{x}$

(e): $\frac{1}{\sqrt[3]{x^4}} = \frac{1}{\sqrt[3]{x^3 \cdot x}} = \frac{1}{x \sqrt[3]{x}} = \frac{1}{x \sqrt[3]{x}} \cdot \frac{\sqrt[3]{x^2}}{\sqrt[3]{x^2}} = \frac{\sqrt[3]{x^2}}{x^2}$

Q7. (4 points) (P.5 Textbook Example 4):

Use the Special Product Formulas to find each product.

(a): $(3x + 5)^2$ **(b):** $(x^2 - 2)^3$

SOLUTION

(a) Substituting $A = 3x$ and $B = 5$ in Product Formula 2, we get

$$(3x + 5)^2 = (3x)^2 + 2(3x)(5) + 5^2 = 9x^2 + 30x + 25$$

(b) Substituting $A = x^2$ and $B = 2$ in Product Formula 5, we get

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

 **Now Try Exercises 45 and 63**

Q8. (6 points) (P.6 Textbook Exercise 20, 21 and 22): Factor

(a): $5x^2 - 7x - 6$

(b): $(3x + 2)^2 + 8(3x + 2) + 12$

(c): $2(a + b)^2 + 5(a + b) - 3$

Solution:

20. $5x^2 - 7x - 6 = (5x + 3)(x - 2)$

21. $(3x + 2)^2 + 8(3x + 2) + 12 = [(3x + 2) + 2][(3x + 2) + 6] = (3x + 4)(3x + 8)$

22. $2(a + b)^2 + 5(a + b) - 3 = [(a + b) + 3][2(a + b) - 1] = (a + b + 3)(2a + 2b - 1)$

Q9. (6 points) (P.6 Textbook Exercise 46, 97 and 114): Factor

(a): $8r^3 - 64t^6$

(b): $3x^3 - x^2 - 12x + 4$

(c): $\frac{1}{2}x^{-1/2}(3x + 4)^{1/2} + \frac{3}{2}x^{1/2}(3x + 4)^{-1/2}$

Solution:

(a): $8r^3 - 64t^6 = 8(r^3 - 8t^6)$
 $= 8[r^3 - (2t^2)^3]$
 $= 8(r - 2t^2)(r^2 + r(2t^2) + 4t^4)$

OR:

46. $8r^3 - 64t^6 = (2r - 4t^2)(4r^2 + 8rt^2 + 16t^4)$

97. $3x^3 - x^2 - 12x + 4 = 3x^3 - 12x - x^2 + 4 = 3x(x^2 - 4) - (x^2 - 4)$
 $= (3x - 1)(x^2 - 4) = (3x - 1)(x - 2)(x + 2)$

$$\begin{aligned}
 114. \quad \frac{1}{2}x^{-1/2} (3x + 4)^{1/2} + \frac{3}{2}x^{1/2} (3x + 4)^{-1/2} &= \frac{1}{2}x^{-1/2} (3x + 4)^{-1/2} [(3x + 4) + 3x] \\
 &= \frac{1}{2}x^{-1/2} (3x + 4)^{-1/2} (6x + 4) \\
 &= x^{-1/2} (3x + 4)^{-1/2} (3x + 2)
 \end{aligned}$$

Q10. (6 points) (P.7 Textbook Exercise 46 and 97): Simplify

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

(b): $\frac{2x + 1}{2x^2 + x - 15} \div \frac{6x^2 - x - 2}{x + 3} = ?$

(c): $\frac{\frac{x^3}{x + 1}}{\frac{x}{x^2 + 2x + 1}} = ?$

Solution:

$$30. \quad \frac{x^2 - x - 6}{x^2 + 2x} \cdot \frac{x^3 + x^2}{x^2 - 2x - 3} = \frac{(x - 3)(x + 2)}{x(x + 2)} \cdot \frac{x^2(x + 1)}{(x - 3)(x + 1)} = x$$

$$34. \quad \frac{2x + 1}{2x^2 + x - 15} \div \frac{6x^2 - x - 2}{x + 3} = \frac{2x + 1}{(x + 3)(2x - 5)} \cdot \frac{x + 3}{(2x + 1)(3x - 2)} = \frac{1}{(2x - 5)(3x - 2)}$$

$$35. \quad \frac{\frac{x^3}{x + 1}}{\frac{x}{x^2 + 2x + 1}} = \frac{x^3}{x + 1} \cdot \frac{x^2 + 2x + 1}{x} = \frac{x^3(x + 1)(x + 1)}{(x + 1)x} = x^2(x + 1)$$

Q11. (3 points) (P.7 Textbook Exercise 78): Simplify $\sqrt{1 + \left(x^3 - \frac{1}{4x^3}\right)^2} = ?$

Solution:

$$\begin{aligned}
 78. \quad \sqrt{1 + \left(x^3 - \frac{1}{4x^3}\right)^2} &= \sqrt{1 + x^6 - \frac{2x^3}{4x^3} + \frac{1}{16x^6}} = \sqrt{1 + x^6 - \frac{1}{2} + \frac{1}{16x^6}} = \sqrt{x^6 + \frac{1}{2} + \frac{1}{16x^6}} \\
 &= \sqrt{\left(x^3 + \frac{1}{4x^3}\right)^2} = \left|x^3 + \frac{1}{4x^3}\right|
 \end{aligned}$$