

**King Fahd University of Petroleum and Minerals**  
**Prep-Year Math Program**

Code: 001

**Prep-Year Math I**  
**EXAM I**  
**Term 082**  
**Sunday, April 12, 2009**  
**Net Time Allowed: 110 minutes**

Code: 001

---

Student's Name: ..... SOLUTION .....

ID #: .....

Section #: .....

---

**Important Instructions:**

1. All types of CALCULATORS, PAGERS, OR MOBILES ARE NOT ALLOWED to be with you during the examination.
2. Use an HB  $2\frac{1}{2}$  pencil.
3. Use a good eraser. Do not use the eraser attached to the pencil.
4. Write your name, ID number and Mathematics Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID Number and Math Section Number, be sure that bubbles match with the number that you write.
6. The Test Code Number is already typed and bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.
9. Check that the exam paper has **22** questions.

Q1.

In standard form, the complex number  $\frac{-7+26i}{4+3i} =$

A)  $-\frac{11}{25} + \frac{7}{25}i$

B)  $-2-9i$

C)  $2-7i$

D)  $2+5i$

E)  $\frac{3}{25} + \frac{4}{25}i$

$$\begin{aligned} & \frac{(-7+26i)(4-3i)}{(4+3i)(4-3i)} \\ &= \frac{-28+21i+104i-78i^2(-1)}{16-12i+12i-9i^2(-1)} = \frac{50+125i}{25} \\ &= \frac{50}{25} + \frac{125i}{25} \\ &= 2+5i \end{aligned}$$

Q2.

$$\frac{1}{2 + \frac{3}{1 + \frac{4}{x}}} =$$

$$\left( \frac{1}{2 + \frac{3x}{x+4}} \right) x+4$$

A)  $\frac{x}{2x+3}$

B)  $\frac{x}{2x+11}$

C)  $\frac{x+4}{2x+3}$

D)  $\frac{x+4}{5x+8}$

E)  $\frac{x+4}{3x+8}$

$$\begin{aligned} &= \frac{x+4}{2(x+4)+3x} \\ &= \frac{x+4}{2x+8+3x} = \frac{x+4}{5x+8} \end{aligned}$$

Q3.

If the equation  $2x - 3(x+1) = ax + b$  is an identity, then  $a + b =$

A) -2

B) 6

C) -4

D)  $\frac{1}{3}$

E) 0

$$2x - 3x - 3 = ax + b$$

$$-x - 3 = ax + b$$

by identity  $a = -1$

$$b = -3$$

$$a + b = -4$$

Q4.

The sum of the coefficients of  $x^2y$  and  $xy^2$  in the expression  $(2x - 3y)^3$  is

A) 18

B) -80

C) -18

D) -36

E) 80

$$(2x - 3y)^3 = 8x^3 - 36x^2y + 54xy^2 - 27y^3$$

$$-36 + 54 = 18$$

Q5.

If  $A = \{x | x \leq -3\} \cup \{x | x > 1\}$  and  $B = \{x | 0 \leq x \leq 3\} \cap \{x | 1 < x < 4\}$ , find  $A \cap B$

A)  $(-\infty, 0] \cup [3, 4)$

B)  $(1, 4)$

C)  $(1, 3]$

D)  $[3, \infty)$

E)  $(-\infty, 3]$

$$A = \{x \leq -3\} \cup \{x > 1\}$$
$$(-\infty, -3] \cup (1, \infty)$$

$$B = [0, 3] \cap (1, 4) = (1, 3]$$

$$A \cap B = (-\infty, -3] \cup (1, \infty) \cap (1, 3]$$
$$= (1, 3]$$

Q6.

The degree of the polynomial  $(xy^2 - 1)^3 (2x + 1)^2$  is

A) 5

B) 6

C) 11

D) 9

E) 10

$$(xy^2 - 1)^3 (2x + 1)^2$$
$$= ((xy^2)^3 - 3(xy^2)^2 + 3(xy^2) - 1) (4x^2 + 4x + 1)$$

$$= (xy^2)^3 \cdot 4x^2 \text{ is the leading term}$$

with degree 11

Q7.

$$\frac{1}{|\sqrt{8}-3|} + \frac{1}{|-\sqrt{8}-3|} =$$

A)  $6 - 2\sqrt{8}$

B)  $-6$

C)  $6$

D)  $6 + 2\sqrt{8}$

E)  $2\sqrt{8}$

$$\frac{1}{|\sqrt{8}-3|} + \frac{1}{|-\sqrt{8}-3|} = 0$$

$$\frac{1}{-\sqrt{8}+3} + \frac{1}{\sqrt{8}+3} = \frac{\sqrt{8}+3 + 3-\sqrt{8}}{(3-\sqrt{8})(3+\sqrt{8})}$$

$$= \frac{6}{9-8} = 6$$

Q8.

One factor of the polynomial  $27 + (x-4)^3$  is

A)  $x^2 - 11x + 37$

B)  $x^2 - 5x + 37$

C)  $x^2 - 5x + 13$

D)  $x^2 - 11x + 13$

E)  $x^2 - 11x + 29$

$$3^3 + (x-4)^3$$

$$(3+x-4)(9-3(x-4)+(x-4)^2)$$

$$(-1+x)(9-3x+12+x^2-8x+16)$$

$$(-1+x)(x^2-11x+37)$$

↑  
(A)

Q9.

The sum of all real solutions of the equation  $\frac{-7+5|3x-4|}{7|3x-4|-2} = -3$  is

A)  $\frac{19}{3}$

B)  $\frac{29}{4}$

C)  $\frac{23}{2}$

D)  $\frac{25}{2}$

E)  $\frac{8}{3}$

$$-7 + 5|3x-4| = -3(7|3x-4| - 2)$$

$$5|3x-4| = -21|3x-4| + 6 + 7$$

$$26|3x-4| = 13$$

$$|3x-4| = \frac{13}{26}$$

$$3x-4 = \frac{1}{2} \quad \text{OR} \quad 3x-4 = -\frac{1}{2}$$

$$3x = 4 + \frac{1}{2} \quad \text{OR} \quad 3x = 4 - \frac{1}{2}$$

$$x = \frac{9}{6} = \frac{3}{2} \quad \text{OR} \quad x = \frac{7}{6}$$

Sum  
 $\frac{3}{2} + \frac{7}{6} = \frac{16}{6}$   
 $= \frac{8}{3}$

Q10.

The quadratic equation  $ax^2 - 7x + c = 0$  has sum of solutions  $\frac{7}{6}$  and product of solutions  $-\frac{1}{2}$ . The value of  $a+c$  is

A) -1

B) 5

C) 3

D) -2

E) -4

The Sum  $-\frac{b}{a} = \frac{7}{6}$

$$b = -7 \quad \cdot \quad \frac{7}{a} = \frac{7}{6} \Rightarrow a = 6$$

The product  $\frac{c}{a} = -\frac{1}{2}$

$$\frac{c}{6} = -\frac{1}{2} \Rightarrow c = -3$$

$$a+c = 6-3 = 3$$

Q11.

If  $\frac{1}{y} = \frac{1}{m} + \frac{1}{x} + \frac{1}{t}$ , then  $x =$

A)  $\frac{mt - ty - my}{mty}$

B)  $y - m - t$

C)  $\frac{mt + ty - my}{mty}$

D)  $\frac{mty}{mt - ty - my}$

E)  $\frac{mty}{mt + ty - my}$

$$\frac{1}{x} = \frac{1}{y} - \frac{1}{m} - \frac{1}{t} \quad \text{LCD} = ymt$$

$$\frac{1}{x} = \frac{mt - yt - my}{ymt}$$

$$x = \frac{ymt}{mt - yt - my}$$

Q12.

If  $x^2 - 6x + 25 = 0$  is written in the complete square form  $(x - m)^2 = n$ , then  $2m - n =$

A) -19

B) 13

C) -10

D) 22

E) -18

$$x^2 - 6x = -25$$

$$x^2 - 6x + 9 = -25 + 9$$

$$(x - 3)^2 = -16$$

$$m = 3 \quad n = -16$$

$$2m - n = 2(3) - (-16)$$

$$= 6 + 16 = 22$$

Q13.

$$\frac{x^{-4} - y^{-2}}{x^{-2}y^{-1}(x^{-2} - y^{-1})} =$$

A)  $\frac{xy}{x+y}$

B)  $xy(x+y)$

C)  $\frac{xy}{x^2 - y}$

D)  $x^2 + y$

E)  $\frac{1}{x^2 + y}$

LCD =  $x^2y$

$$\begin{aligned} &= \frac{x^{-4} - y^{-2}}{x^{-2}y^{-1}(x^{-2} - y^{-1})} \\ &= \frac{(x^{-2})^2 - (y^{-1})^2}{x^{-2}y^{-1}(x^{-2} - y^{-1})} = \frac{\cancel{(x^{-2} - y^{-1})}(x^{-2} + y^{-1})}{x^{-2}y^{-1}\cancel{(x^{-2} - y^{-1})}} \\ &= \frac{\left(\frac{1}{x^2} + \frac{1}{y}\right) x^2y}{\left(\frac{1}{x^2y}\right) x^2y} = \frac{y + x^2}{1} \\ &= x^2 + y \end{aligned}$$

Q14.

$$xy^2 \sqrt[3]{16x^6y^4} - 4x^2y \sqrt[3]{128x^3y^7} =$$

A)  $-3x^2y^2 \sqrt[3]{2xy}$

B)  $-14x^3y^3 \sqrt[3]{2y}$

C)  $-12x^3y^2 \sqrt[3]{2x^2y}$

D)  $-16x^2y^3 \sqrt[3]{2x^2y}$

E)  $-4x^2y^3 \sqrt[3]{2x}$

$$\begin{aligned} &= xy^2 \sqrt[3]{8 \cdot 2 \cdot x^6 \cdot y^3 \cdot y} - 4x^2y \sqrt[3]{64 \cdot 2 \cdot x^3 \cdot y^6 \cdot y} \\ &= 2x^3y^3 \sqrt[3]{2y} - 16x^3y^3 \sqrt[3]{2y} \\ &= -14x^3y^3 \sqrt[3]{2y} \end{aligned}$$

Q15.

If  $x < -1$ , then  $|2x| + |-4x| + \frac{|x|}{x}$  simplifies to

- A)  $2x-1$
- B)  $6x+1$
- C)  $-6x+1$
- D)  $-2x+1$
- E)  $-6x-1$

$$-2x - 4x + \frac{-x}{x}$$

$$-6x - 1$$

Q16.

The sum of the real part and the imaginary part of the complex number

$$(\sqrt{-9} + \sqrt[3]{-8})^2 + i^{-23}, \text{ where } i = \sqrt{-1}, \text{ is}$$

- A) -12
- B) -4
- C) -16
- D) 14
- E) 12

$$(\sqrt{-9} + \sqrt[3]{-8})^2 + i^{-23}$$

$$= (\sqrt{-9} \cdot \sqrt{-9} + 2\sqrt{-9} \sqrt[3]{-8} + (\sqrt[3]{-8})^2) + \frac{1}{i^3}$$

$$= -9 - 12i + 4 + \frac{i}{i^4}$$

$$= -5 - 11i$$

Real + Imaginary  
 $-5 + (-11) = -16$

Q17.

The value of  $k$  that makes the trinomial  $4x^2 - 12x + k + 1$  a perfect square is

A) 9

B) 3

C) 6

D) 15

E) 8

$$b^2 - 4ac = 0$$

$$(-12)^2 - 4(4)(k+1) = 0$$

$$144 - 16k - 16 = 0$$

$$-16k + 128 = 0$$

$$-16k = -128$$

$$k = \frac{-128}{-16} = 8$$

Q18.

$$\frac{6x^2 + 13xy + 6y^2}{4x^2 - 9y^2} \div \frac{x+6y}{2x-3y} - \frac{6x+9y}{2x+3y} =$$

A)  $\frac{-6x}{x-6y}$

B)  $\frac{-8y}{2x+3y}$

C)  $\frac{3x-8y}{2x+3y}$

D)  $\frac{-12x}{2x-3y}$

E)  $\frac{-16y}{x+6y}$

Factor

$$\frac{(2x+3y)(3x+2y)}{(2x-3y)(2x+3y)} \cdot \frac{2x-3y}{x+6y} - \frac{6x+9y}{2x+3y}$$

$$= \frac{3x+2y}{x+6y} - \frac{6x+9y}{2x+3y}$$

$$\text{LCD} = (x+6y)(2x+3y)$$

$$= \frac{(3x+2y)(2x+3y) - (6x+9y)(x+6y)}{(x+6y)(2x+3y)}$$

$$= \frac{6x^2 + 13xy + 6y^2 - 6x^2 - 45xy - 54y^2}{(x+6y)(2x+3y)}$$

$$(x+6y)(2x+3y)$$

$$= \frac{-32xy - 48y^2}{(x+6y)(2x+3y)} = \frac{-16y(2x+3y)}{(x+6y)(2x+3y)} = \frac{-16y}{x+6y}$$

Q19.

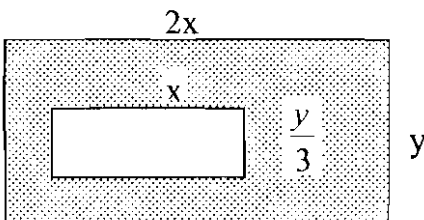
The expression  $6(-2x + 4y - 5) - 3[2x - 4(3x - 2y + 1)]$  simplifies to

- A)  $18x + 24y - 18$
- B)  $18x + 18$
- C)  $18x - 18$
- D)  $18x - 18y$
- E)  $16x + 20y - 18$

$$\begin{aligned} & -12x + 24y - 30 - 3[2x - 12x + 8y - 4] \\ & = -12x + 24y - 30 - 3[-10x + 8y - 4] \\ & = -12x + 24y - 30 + 30x - 24y + 12 \\ & = 18x - 18 \\ & = 18x - 18 \end{aligned}$$

Q20.

In the adjacent figure, the area of the big rectangle is  $24 \text{ cm}^2$ . The area of the shaded region is



- A)  $16 \text{ cm}^2$
- B)  $10 \text{ cm}^2$
- C)  $6 \text{ cm}^2$
- D)  $15 \text{ cm}^2$
- E)  $20 \text{ cm}^2$

$$\begin{aligned} 2x \cdot y &= 24 \\ \boxed{x \cdot y} &= 12 \\ \text{the shaded region} &= 2x \cdot y - \frac{x \cdot y}{3} \\ &= 24 - \frac{12}{3} \\ &= 24 - 4 = 20 \end{aligned}$$

Q21.

One factor of the polynomial  $4 + 8x - 20x^4 - 10x^3$  is

- A)  $2 - 5x^3$
- B)  $2 + 5x^3$
- C)  $2 + x$
- D)  $4x$
- E)  $1 - 2x$

$$= 4(1+2x) - 10x^3(2x+1)$$
$$= 2^2(2x+1)(2-5x^3)$$

↑  
A

Q22.

The solution set of the equation  $\frac{1}{2}x + 7 - \frac{1}{4}x = \frac{19}{2}$  consists of

- A) one positive even integer
- B) one negative even integer
- C) one positive odd integer
- D) one non integer rational number
- E) one negative odd integer

multiply by LCD = 4

$$2x + 28 - x = 38$$

$$x = 38 - 28 = 10$$