

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

Prep-Year Math I
MIDTERM EXAM
Semester II, Term 052
Tuesday March 28, 2006
Net Time Allowed: 120 minutes

Sources of Problems

MASTER VERSION

1. If $A = \{x|x \leq -2\} \cup \{x|x \geq 1\}$ and $B = \{x|x > -3\} \cap \{x|x < 5\}$, then the set $A \cap B$ in interval notation is equal to

~~(a)~~ $(-3, -2] \cup [1, 5)$

(b) $[-2, 5)$

(c) $(-\infty, -3) \cup [1, \infty)$

(d) $(-3, 1]$

(e) the empty set ϕ

See example 6 p. 9
and problems 51 to 66

2. If the equation $18x - 12 = 3(ax + b) - 6x$ is an identity, then $a + b =$

~~(a)~~ 4

(b) -1

(c) 0

(d) 3

(e) -3

See example 4 p. 85
and problems 23 to 32 p. 88

3. One factor of $(x - 5)^3 + 8$ is

~~(a)~~ $x^2 - 12x + 39$

Similar to problems 61, 62 p. 54

(b) $x^2 - 12x + 19$

(c) $x^2 + 12x - 39$

(d) $x^2 + 12x + 19$

(e) $x^2 - 12x - 39$

4. If $t = \frac{3}{2}x(5y - 7z)$, then $z =$

~~(a)~~ $\frac{15xy - 2t}{21x}$

See example 1 p. 91

(b) $\frac{5xy - 2t}{3}$

and problems 1 to 10 p. 98

(c) $\frac{15xy + 2t}{7x}$

(d) $\frac{2t}{15xy + 7}$

(e) $\frac{15xy - 2t}{7x}$

5. The **sum** of all solutions of the equation $3|2x+1|+4=28$ is equal to

~~(a)~~ -1

(b) 1

(c) 0

(d) -3

(e) 3

see example 5 p. 86

and problems 33 to 48 p. 88-89

6. The expression $2(x+y)^3 - 3(x-y)^3$ simplifies to

~~(a)~~ $-x^3 + 15x^2y - 3xy^2 + 5y^3$

(b) $-x^3 - 3x^2y - 3xy^2 + 5y^3$

(c) $-x^3 + 15x^2y - xy^2 + 5y^3$

(d) $-x^3 + 3x^2y - 3xy^2 + 5y^3$

(e) $-x^3 + 5y^3$

similar to problems

84 to 89 p. 43

7. The solutions of the equation

$$\frac{3}{4}x^2 - \frac{3}{2}x + \frac{9}{4} = 0$$

are the complex numbers

*See example 6 p. 109
and problems 31, 32 p. 113*

~~(a)~~ $1 \pm \sqrt{2}i$

(b) $-1 \pm \sqrt{2}i$

(c) $2 \pm 2\sqrt{2}i$

(d) $-2 \pm \sqrt{2}i$

(e) $-2 \pm 2\sqrt{2}i$

8. The expression $6 - 12 \left[-\frac{3}{4}x - \left(\frac{5}{6}x - \frac{1}{3} \right) \right]$ simplifies to

~~(a)~~ $19x + 2$

(b) $\frac{49}{6}x + \frac{19}{3}$

(c) $-x + 10$

(d) $\frac{59}{6}x - \frac{17}{3}$

(e) $19x + 10$

*See example 9 p. 13
and problems 99 to 106 p. 17*

$$9. \frac{3}{\sqrt{5} - \sqrt{2}} - \frac{2}{2\sqrt{5} - 3\sqrt{2}} =$$

~~(a)~~ $-\sqrt{5} - 2\sqrt{2}$

(b) $6 + 2\sqrt{10}$

(c) $-\sqrt{5} + 6\sqrt{2}$

(d) $-6 - 2\sqrt{10}$

(e) $\sqrt{5} + 2\sqrt{2}$

See example 9 p.31

and problems # 107 to 112 p.33

10. If the equation $9x^2 + (3x + 1)k = 0$ has two equal roots, where $k \neq 0$, then $k =$

~~(a)~~ 4

(b) -4

(c) 3

(d) -3

(e) -2

See example 6 p.109

and problems 47 to 56 p.113

11. The coefficient of x^2y in the product $(4x - 5y)(2x - y)(3x - 4y)$ is equal to

~~(a)~~ -74

(b) -10

(c) -43

(d) 10

(e) -33

See example 1 p. 36

example 3 p. 37

and problems # 53, 54 p. 41

12. The equation $\frac{20x - 9}{4} = \frac{15x + 11}{3}$ is

~~(a)~~ a contradiction

(b) a conditional

(c) an identity

(d) equivalent to the equation $60x - 27 = 0$

(e) equivalent to the equation $60x + 44 = 0$

See example 1 p. 85

and problems 23 to 32 p. 88

13. The standard form of the complex number $i^{153} + \frac{i}{1-i}$ is

~~(a)~~ $-\frac{1}{2} + \frac{3}{2}i$

(b) $\frac{1}{2} - \frac{3}{2}i$

(c) $-\frac{1}{2} - \frac{3}{2}i$

(d) $\frac{1}{2} + \frac{3}{2}i$

(e) $-\frac{1}{2} - \frac{i}{2}$

See examples 4 and 5 p. 70-71
and problems 37 & 62 p. 72

14. The expression $\frac{x}{x^2-1} - \frac{3}{x^2+4x-5}$ simplifies to

~~(a)~~ $\frac{x+3}{(x+1)(x+5)}$

(b) $\frac{x+3}{(x-1)(x+5)}$

(c) $\frac{x^2-x+3}{(x-1)(x+1)(x+5)}$

(d) $\frac{x+3}{(x-1)(x+1)(x+5)}$

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

See example 3 p. 59

and problems 31, 32 p. 63

15. The number of real roots of the equation $5x^{-4} + 2x^{-3} = 0$ is

- ~~(a)~~ 1 *An application of solving by factoring*
- (b) 2
- (c) 3
- (d) 4
- (e) 0

16. The solution set, in interval notation, of the compound inequality

$$|2x - 1| \leq 3 \text{ and } x^2 + 2x \geq 0$$

is

*see examples 1 to 4 p. 130-133
and problems 9 to 28 p. 140*

- ~~(a)~~ $[0, 2]$
- (b) $[-2, -1] \cup [0, \infty)$
- (c) $(-\infty, -1] \cup [0, \infty)$
- (d) $(-\infty, -2] \cup [0, 2]$
- (e) $[-2, -1] \cup [2, \infty)$

17. The solution set of the equation

$$(x + 1)^{2/3} - 2(x + 1)^{1/3} - 3 = 0$$

contains

- ~~(a)~~ one positive and one negative integers
 (b) two positive integers
 (c) two negative integers
 (d) one positive and one negative irrational numbers
 (e) two positive irrational numbers

*See example 9 p. 124
 and problems
 47-50 p. 126*

18. The solution, in interval notation, of the inequality $\frac{3x^2 + 6x - 16}{x - 1} \geq 8$ is

- ~~(a)~~ $\left[-\frac{4}{3}, 1\right) \cup [2, \infty)$
 (b) $[-2, 0) \cup (2, \infty)$
 (c) $\left(-\frac{2}{3}, 0\right) \cup \left(\frac{5}{2}, \infty\right)$
 (d) $(-\infty, -3) \cup (2, \infty)$
 (e) $\left(-\frac{4}{3}, 0\right] \cup [1, 2]$

*Similar to problems 47-50
 p. 140*

19. $\frac{x^{-1} - y^{-1}}{x^{-2}y^{-2}} \div \frac{x^{-2} - y^{-2}}{x^{-3}y^{-3}} =$

~~(a)~~ $\frac{1}{x+y}$

(b) $\frac{x}{x+y}$

(c) $\frac{y}{x+y}$

(d) $\frac{xy}{x+y}$

(e) $xy(x+y)$

See examples 4 and 5 p. 60-61

and problems 41-62 p. 63-64

20. If the expression $3x^2 + 5x + 2$ is written in the form $3(x+a)^2 + b$, then the product ab is equal to

~~(a)~~ $-\frac{5}{72}$

(b) $\frac{49}{12}$

(c) $-\frac{25}{36}$

(d) $\frac{5}{12}$

(e) $-\frac{5}{36}$

See example 3 and 4 p. 106-107

and problems 21 to 32 p. 113

21. Three students decided to share the cost of a car. By bringing in an additional student, they can reduce the cost of each student by 4000 Saudi Riyals. The total cost of the car is

- ~~(a)~~ 48000 Saudi Riyals
 (b) 64000 Saudi Riyals
 (c) 72000 Saudi Riyals
 (d) 44000 Saudi Riyals
 (e) 52000 Saudi Riyals

See problem # 52 p. 101

22. The expression $\frac{\sqrt[3]{x^2}\sqrt{\sqrt{x}}}{\sqrt[4]{x^3}}$ in simplest form is equal to

- ~~(a)~~ $\sqrt[6]{x}$
 (b) $\sqrt[12]{x^5}$
 (c) $\frac{1}{\sqrt{x^3}}$
 (d) $\sqrt[6]{x^5}$
 (e) $\sqrt[12]{x}$

An application of

$$\sqrt[n]{b^m} = b^{m/n} \quad \text{p. 26}$$

$$\text{and } \sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} \quad \text{p. 28}$$

23. If $-5 < x < -2$, then the expression

$$||x + 5| + |x - 2| + \sqrt{x^2} + \sqrt[3]{x^3}|$$

simplifies to

- ~~(a)~~ 7
(b) $-2x - 3$
(c) $2x + 3$
(d) 3
(e) $2x + 7$

See problems 31 to 40 p. 16
together with $\sqrt{x^2} = |x|$.

24. If $z = 2 - 3i$, then the imaginary part of the complex number $z^2 - 3z + 5$ is equal to

- ~~(a)~~ -3
(b) -15
(c) 21
(d) -11
(e) 6

See p. 66 (for the real and
imaginary part of a complex
number)
and problems 75 & 76 p. 72

25. One factor of $25y^{2m} - (x^{2n} - 2x^n + 1)$ is

~~(a)~~ $5y^m - x^n + 1$

(b) $5y^m + x^n + 1$

(c) $5y^m - x^n - 1$

(d) $5y^{2m} - x^n - 1$

(e) $5y^m + x^{2n} - 1$

See problems 94 & 95 p. 54