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

Code 004

Math 001 Final Exam
Term (022)
June 08, 2003
Time Allowed: 2 1/2 Hours

Code 004

STUDENT NAME: objectives & Source

ID #:_____ SECTION # :_____

Important Instructions:

1. **All TYPES of CALCULATORS, PAGERS or TELEPHONES are NOT allowed during the examination.**
2. **Use HB 2.5 pencils only**
3. **Use a good eraser. Do NOT use the erasers attached to the pencil.**
4. **Write your name, ID number and Math section number on both the examination paper and the OMR sheet.**
5. **Detach the OMR sheet carefully.**
6. **When bubbling your ID number and Math section number, be sure that the bubbles match with the number that you write.**
7. **Match the Test Code Number already bubbled in your answer sheet with the Test Code Number printed on your question paper.**
8. **When erasing a bubble, make sure that you do not leave any trace of penciling.**
9. **Check that the exam paper has 30 questions.**

1. If $i = \sqrt{-1}$, then $\dfrac{2i^9}{-1+i}$ is equal to

(a) $1+i$

(b) $-1-i$

(c) $1-i$

(d) $-1+i$

(e) $2-2i$

(1.3)* See powers of i page 88 + Example 5 p. 88 & #38 p. 96

objective: To write a complex number in standard form

2. Which one of the following numbers is in **the range** of the function $f(x) = -3x^2 + 6x - 4$?

(a) $\sqrt{2}+2$

(b) $-\sqrt{2}$

(c) $-\dfrac{1}{3}$

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

(e) $-\dfrac{1}{2}$

(2.4) See Example 3 page 183 and # 32 p. 189

objective: To know the range of a quadratic function

3. The graph of the equation $|x| + |y - 1| = 8y^2$ is **symmetric** with respect to

(a) the x-axis only

(b) the origin only

(c) the x-axis and the origin

(d) the y-axis only

(e) the x-axis, the y-axis and the origin

(2-5) See example 1 p. 193 and example 2 p 194

objective: To determine the type of symmetry of a graph

4. The polynomial $P(x) = x^3 - 4x - 4$ has a zero between:

(a) -1 and 0

(b) 0 and 1

(c) 3 and 4

(d) -3 and -2

(e) 2 and 3

(3.2) See example 3 p. 252

objective: To apply the Zero Location Theorem

5. If the graph of the equation $y = -\frac{1}{x}$ is shifted left horizontally 2 units and up vertically 3 units, then the equation of the new graph is

(a) $y = \frac{3x+5}{x+2}$

(b) $y = \frac{-3x+4}{x+2}$

(c) $y = \frac{2x+7}{x+2}$

(d) $y = \frac{3x+7}{x-2}$

(e) $y = \frac{2x-7}{x-2}$

(2.5) See example 4 p. 197 and # 58 p. 202

Objective: How to apply horizontal and vertical translations

6. If $m \neq n$ and $m(x-n) = nx + k$, then $x =$

(a) $\frac{mn+k}{m+n}$

(b) $\frac{n-k}{m-n}$

(c) $\frac{n+k}{m-n}$

(d) $\frac{n+k}{m+n}$

(e) $\frac{mn+k}{m-n}$

(1-2) See example 1 p 73 and #1 to 15 p. 79

Objective: To solve a formula for a specified variable.

7. If $i = \sqrt{-1}$, then **the remainder** when $P(x) = 2x^{103} + x^{102} + x^{101} + x^{100}$ is divided by $x + i$ is equal to

(a) $-i$

(b) 1

(c) i

(d) -1

(e) 0

(3.1) See example 3 p.242 and #71, 72 p.246

Objective: To apply the remainder theorem

8. Which one of the following statements is FALSE?

(a) The distance between the points $(1, 2)$ and $(1, 3)$ is 1

(b) The graph of $x^2 + y^2 + 9 = 0$ is a circle with radius 3

(c) The graph of $x^2 + y^2 = 0$ is the point $(0, 0)$

(d) The distance between the points $(3, 2)$ and $(3, 8)$ is 6

(e) The graph of $x^2 + y^2 - 9 = 0$ is a circle with center at $(0, 0)$

(2.1) # 5 to 10 p.144 & 145

41 to 52 p. 145

objective: To recognize an equation with its graph.

9. The graph of $y = \dfrac{x^2+3x-2}{2x^2+x+10}$ intersects its horizontal asymptote when x is equal to

3.5 #67 p. 293

objective To determine the point where the graph of a function intersects its horizontal asymptote

(a) $\dfrac{14}{5}$

(b) $-\dfrac{1}{2}$

(c) $\dfrac{11}{5}$

(d) $-\dfrac{2}{5}$

(e) $\dfrac{19}{5}$

10. If $i = \sqrt{-1}$ is a zero of the polynomial $P(x) = x^4 - 2x^3 + 2x^2 - 2x + 1$, then **the number of the x-intercepts** of the graph of $P(x)$ is equal to

3.1 & 3.4

See Example 1 p 271

objective: To apply the conjugate pair theorem and the factor theorem

(a) 0

(b) 2

(c) 3

(d) 1

(e) 4

11. The solution set, in interval notation, of the inequality $\left|\frac{3}{2} - 5x\right| \geq 1$ is equal to

(1.5) See Example 3 p111

objective: To Solve an absolute value inequality

(a) $\left[\frac{1}{10}, \frac{1}{2}\right]$

(b) $\left(-\infty, -\frac{1}{2}\right] \cup \left[-\frac{1}{10}, \infty\right)$

(c) $\left[-\frac{1}{2}, -\frac{1}{10}\right]$

(d) $\left(-\infty, \frac{1}{10}\right] \cup \left[\frac{1}{2}, \infty\right)$

(e) $\left(-\infty, -\frac{10}{3}\right] \cup \left[\frac{10}{3}, \infty\right)$

12. The equation $\frac{2}{x+3} = \frac{1}{x} + \frac{1}{3}$ has

(P.6), (1.1) & (1.4)

objective: To solve an equation which can be reduced to a quadratic equation.

(a) two distinct rational roots

(b) two distinct complex roots that are not real

(c) two distinct irrational roots

(d) a real root that is a double root

(e) one real root and one nonreal root

13. If $f(x) = \dfrac{2x+1}{3x-2}$, then $(f \circ f)(x) =$

(a) $-7x$

(b) $\dfrac{5x}{3x-2}$

(c) $\dfrac{4x-3}{3x-2}$

(d) x

(e) $\left(\dfrac{2x+1}{3x-2}\right)^2$

2.6 See example 5 p. 210 and # 4 of 3 p. 213

objective: To find the composition of two functions

14. The range, in interval notation, of the function $f(x) = \begin{cases} 2 & \text{if } x \leq 1 \\ x & \text{if } x > 1 \end{cases}$, is equal to

(a) $(1, \infty)$

(b) $[1, \infty)$

(c) $[2, \infty)$

(d) $(2, \infty)$

(e) $[0, \infty)$

2.2 This is example 5(b) p. 153

objective: To find the range of a piecewise-defined functions.

15. The **far-left** and the **far-right** behavior of the graph of the function $f(x) = -4x^3 + 3x^2 + 8x - 100$ are one of the following:

(a) goes down to its far left and up to its far right

(b) goes up to its far left and down to its far right

(c) goes up to its far left and up to its far right

(d) goes down to its far left and down to its far right

(e) none of the above

3.2 See Example 1 P. 248

objective To determine the far-left and far-right behavior of the graph of a function.

16. An equation of the **slant asymptote** of the graph of $y = \dfrac{3x^3 - x - 10}{x^2 - 2x - 3}$ is

(a) $y = 3x + 6$

(b) $y = 3x - 5$

(c) $y = 3x + 5$

(d) $y = \frac{1}{3}x + 4$

(e) $y = -3x + 7$

3.5 See example 5 p. 286

objective: To find the slant asymptote of the graph of a rational function.

17. The equation $x + \sqrt{x+5} = 1$ has

(a) only one negative integer root

(b) two positive integer roots

(c) one positive and one negative integer roots

(d) no real roots

(e) one real and one nonreal roots

1.4 See example 3 p. 101. objective To solve a radical equation.

18. If a line segment AB has the midpoint $M(9,3)$ and one endpoint $A(5,1)$, then the other endpoint is

(a) $B(13,9)$

(b) $B(5,5)$

(c) $B(13,5)$

(d) $B(7,5)$

(e) $B(13,2)$

2.1 See # $S_1 = S_2$ p. 149 objective To apply the midpoint formula

19. If $f(x) = x^3$ and $h > 0$, then $\dfrac{f(2-h) - f(2)}{h} =$

(a) $-12 - 6h - h^2$

(b) $-12 - 6h + h^2$

(c) $12 - 6h - h^2$

(d) $12 + 6h - h^2$

(e) $-12 + 6h - h^2$

2.6 & P.4

See example 3 P.70

Objective: To determine a difference quotient.

20. If $\dfrac{1}{4}$ is a zero of **multiplicity** 2 of the polynomial

$$P(x) = 16x^4 - 8x^3 - 399x^2 + 200x - 25,$$

then one of the following expressions is a **factor** of $P(x)$:

(a) $16x^2 + 25$

(b) $25x^2 - 400$

(c) $16x^2 - 400$

(d) $25x^2 + 400$

(e) $16x^2 - 25$

3.3 & 3.1

Objective: To apply synthetic division and the factor theorem

21. The sum of all **noninteger rational** zeros of the polynomial $P(x) = 4x^4 + 4x^3 + 23x^2 - x - 6$ is equal to

(a) 0

(b) 1

(c) -1

(d) $\frac{5}{2}$

(e) $-\frac{3}{2}$

3.3 See exapl 4 p. 261

objective: To find the noninteger rational zeros of a polynomial.

22. If $f^{-1}(x) = 2 + \sqrt{x-1}$, $1 \leq x < \infty$, then $f(4) =$

(a) 6

(b) 4

(c) 5

(d) 8

(e) 9

4.1 # 34 p 307

objective Te evaluate the inverse of a given function at a certain point

23. The **least common denominator (LCD)** of the expression

$$\frac{1}{4(x-1)(x-2)(x+3)^2}+\frac{5}{8(x-1)(x-2)^2(x+3)}+\frac{6}{20(x-1)^2(x-2)(x+3)}$$

is equal to

F.6 See exple 3 p52
#37, 38 p56

(a) $40(x-1)(x-2)(x+3)$

(b) $40(x-1)^4(x-2)^4(x+3)^4$

(c) $640(x-1)^4(x-2)^4(x+3)^4$

(d) $40(x-1)^2(x-2)^2(x+3)^2$

(e) $640(x-1)(x-2)(x+3)$

Objective: To determine the LCD of given expression.

24. The graph of the rational function $f(x)=\dfrac{x}{x^2-9}$ is

3-5 See #37 p291

(a) increasing for every x in its domain

(b) decreasing for every x in its domain

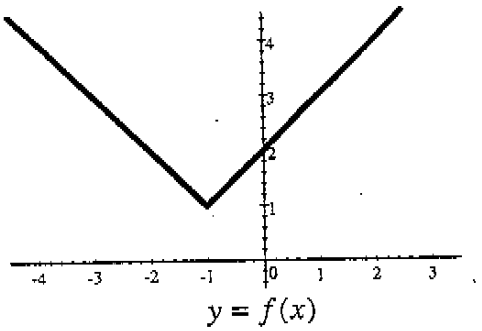
Objective: To graph a rational function

(c) decreasing on $(-\infty,-3)\cup(3,\infty)$ and increasing on $(-3,3)$

(d) decreasing on $(-3,3)$ and increasing on $(-\infty,-3)\cup(3,\infty)$

(e) decreasing on $(-\infty,-3)\cup(-3,0)$ and increasing on $(0,3)\cup(3,\infty)$

25. The adjacent figure is the graph of $y = f(x)$. If $E(x) = |x-1|+1$, then which one of the following statements is **TRUE**?



(a) $f(x) = -E(x)$

(b) $f(x) = E(x-1)$

(c) $f(x) = E(x+1)$

(d) $f(x) = E\left(\frac{1}{2}x\right)$

(e) $f(x) = E(-x)$

2.5 See example 5 p 198

60 p. 203 (which is very close to this question)

objective: To graph by using reflections

26. The graph of a linear function f has the intercepts $(-k, 0)$ and $(0, k)$ where $k \neq 0$. If $f(-3) = 10$, then k is equal to

(a) 16

(b) 7

(c) -4

(d) 2

(e) 13

2.3 See # 63 p. 179

objective: To find the equation of a linear function.

27. The maximum area of a rectangle that has perimeter 1600 meters is equal to

(a) 40000 square meters

(b) 80000 square meters

(c) 240000 square meters

(d) 160000 square meters

(e) 20000 square meters

2.4 #61, 62 p. 141

Objective: To find the maximum of a quadratic function.

28. If $f(x) = \frac{1}{x} - 1$, then the domain D and the range R of the inverse function f^{-1} are

(a) $D = (-\infty, 0) \cup (1, \infty)$ and $R = (-\infty, 0) \cup (0, \infty)$

(b) $D = (0, 1)$ and $R = (-\infty, 0) \cup (0, \infty)$

(c) $D = (-\infty, -1) \cup (-1, \infty)$ and $R = (-\infty, 0) \cup (0, \infty)$

(d) $D = (-\infty, 0) \cup (0, 1) \cup (1, \infty)$ and $R = (-1, 0) \cup (0, 1)$

(e) $D = (-\infty, 1) \cup (1, \infty)$ and $R = (-\infty, 1) \cup (1, \infty)$

4.1 See example 4 p. 307

Objective: To find the domain and range of the inverse function

29. The domain, in interval notation, of $f(x) = \sqrt{\dfrac{(3+x)(1-x)}{(1+x)}}$ is equal to

(a) $(-\infty, -3] \cup (-1, 1]$

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

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

(d) $(-\infty, -3] \cup [1, \infty)$

(e) $(-\infty, -1) \cup [1, \infty)$

(1-5) & (2.2)

See # 33 to 38 p.159

objective: To find the domain of a function.

30. The graph of the rational function $f(x) = \dfrac{(x+1)(x^4+2)}{(x-2)(x^3+1)}$ has the following asymptotes

(3.5) See Example 2 to 7 of (3.5)

(a) two vertical and one slant asymptotes

(b) one vertical and one slant asymptotes

(c) one vertical, one horizontal, and one slant asymptotes

(d) two vertical and one horizontal asymptotes

(e) four vertical and one slant asymptotes

objective: To find the asymptotes of the graph of a rational function.