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

Code 001

MATH 001, Final Exam
Second Semester Term(012)
Saturday, May 25, 2002
Time Allowed: **150 Minutes**

Code 001

STUDENT NAME:_____

ID #:_____ SECTION #:_____

Important Instructions

This Exam consists of 28 Multiple Choice Questions

Bubble the Answers on the OMR Sheet.

Looking around or making an attempt of cheating may cause your expulsion from the Place of Exam.

1. **Use a Clean Eraser for your Answer Sheet. Do not use the eraser attached to the pencil.**
2. **Write your name and ID number** on the examination paper
3. **Match the test Code Number** already bubbled in your **answer sheet** with the **Test Code Number** printed on your **question paper.**
4. When erasing a bubble, make sure that you **do not leave any trace of pencilling.**

1. If the **sum** of the two roots of a quadratic equation is $\frac{7}{2}$ and the **product** of the two roots is -15, then the quadratic equation is:

(a) $2x^2+7x-30=0$

(b) $2x^2-7x-30=0$

(c) $2x^2+7x+30=0$

(d) $2x^2-23x+105=0$

(e) $2x^2-23x-105=0$

2. The **product** of all the solutions of the equation

$$(3x-5)^{2/3}+6(3x-5)^{1/3}=-8$$ is equal to:

(a) $\frac{53}{4}$

(b) $\frac{-27}{4}$

(c) $\frac{17}{3}$

(d) $\frac{59}{3}$

(e) $\frac{-29}{3}$

3. The solution set of the inequality $|x^2+7x+11| \geq 1$, in interval notation is:

(a) $(-\infty,-5]\bigcup[-4,-3]\bigcup[-2,\infty)$
(b) $(-\infty,\ -5]\bigcup[-2,\ \infty)$
(c) $[-2,\infty)$
(d) $[-4,-3]\bigcup(-2,\infty)$
(e) $(-\infty,-5]\bigcup[-4,\infty)$

4. The **length** L of a rectangle is 3 feet less than twice its width W. If the perimeter P of the rectangle is 174 feet, then the **length** L is equal to:

(a) 30 feet

(b) 57 feet

(c) 60 feet

(d) 33 feet

(e) 63 feet

5. The standard form of an equation of a circle that is tangent to both axes, and has its center in the third quadrant, and has a radius $\sqrt{5}$ is given by:

(a) $\left(x+\sqrt{5}\right)^2+\left(y-\sqrt{5}\right)^2=\sqrt{5}$

(b) $\left(x-\sqrt{5}\right)^2+\left(y+\sqrt{5}\right)^2=5$

(c) $\left(x+\sqrt{5}\right)^2+\left(y+\sqrt{5}\right)^2=5$

(d) $\left(x-\sqrt{5}\right)^2+\left(y-\sqrt{5}\right)^2=5$

(e) $\left(x-\sqrt{5}\right)^2+\left(y-\sqrt{5}\right)^2=\sqrt{5}$

6. A ball is thrown directly upward and the height function is given by the equation

$$h(t)=-16t^2+80t+32$$

where t is time in *seconds*. The time interval in *seconds* for which the ball will be **more than** 96 feet above the ground is:

(a) (2,8)

(b) (2,5)

(c) (3,6)

(d) (4,8)

(e) (1,4)

7. If $f(x)=x^2-4x$ for $x\geq 2$, then $f^{-1}(x)$ and its domain D are given by:

(a) $f^{-1}(x)=-2-\sqrt{x+4}$ and $D=[-2,\ \infty)$

(b) $f^{-1}(x)=-4+\sqrt{x+4}$ and $D=[-4,\ \infty)$

(c) $f^{-1}(x)=2\pm\sqrt{x+4}$ and $D=[2,\ \infty)$

(d) $f^{-1}(x)=2-\sqrt{x+4}$ and $D=[4,\ \infty)$

(e) $f^{-1}(x)=2+\sqrt{x+4}$ and $D=[-4,\ \infty)$

8. The largest negative integer that is a **lower bound for** the real zeros of $f(x)=x^5+7x^2-x+3$ is:

(a) -2
(b) -5
(c) -4
(d) -3
(e) -1

9. If $f(x) = -x^2 + 4$, then f is **increasing** on the interval:

(a) $(-\infty, 2)$
(b) $(-\infty, 0)$
(c) $(0, \infty)$
(d) $(-2, 2)$
(e) $(2, \infty)$

10. The graph of the equation $x^2 = |x - y^3|$ is symmetric with respect to:

(a) y-axis only
(b) x-axis only
(c) origin only
(d) x-axis and origin
(e) y-axis and origin

11. The graph of $g(x) = \sqrt{-x-1} + 2$ could be obtained from the graph of $f(x) = \sqrt{x}$ by:

(a) translating 1 unit right, 2 units up and reflecting across the y-axis

(b) translating 1 unit left, 2 units up and reflecting across the x-axis

(c) translating 2 units left, 1 unit down and reflecting across the y-axis

(d) translating 1 unit left, 2 units up and reflecting across the y-axis

(e) translating 1 unit left, 2 units down and reflecting across the x-axis

12. Which one of the following functions **does not** have a **horizontal asymptote**?

(a) $f(x) = \dfrac{(x-5)(x-2)}{x^3-8}$

(b) $f(x) = \dfrac{2x-7}{x+3}$

(c) $f(x) = \dfrac{1}{(x-2)^2}$

(d) $f(x) = \dfrac{3x}{x^2-9}$

(e) $f(x) = \dfrac{x^2+2x}{2x-1}$

13. The graph of the function

$$f(x)=\frac{x^3-4x^2+3x}{x^2-1}$$ has:

(a) only one vertical asymptote given by $x=-1$

(b) only one vertical asymptote given by $x=1$

(c) two vertical asymptotes given by $x=-1$ and $x=1$

(d) a slant asymptote given by $y=x$

(e) three x-intercepts

14. Let

$$f(x)=\begin{cases} x^2-2 & \text{if} \quad x<1 \\ x+2 & \text{if} \quad x\geq 1 \end{cases}$$

If $-10<k<-5$ then $f(-k)+f(k)$ is equal to:

(a) $-k^2-k-4$

(b) k^2-k-4

(c) k^2+k+4

(d) k^2-k

(e) $k-k^2$

15. If i is a zero of $f(x) = x^4 - x^3 - 5x^2 - x - 6$, then the sum of all its real zeros is:

(a) 1
(b) 5
(c) −5
(d) 0
(e) −1

16. The polynomial $p(x) = -2x^3 + 5x^2 - 4x + 12$ has a real zero between:

(a) 2 and 3
(b) 1 and 2
(c) 0 and 1
(d) −1 and 0
(e) −1 and −2

17. A polynomial of **lowest degree** with **only real coefficients** having $-2i$, i and 0 (multiplicity 2) as zeros is:

(a) $x^2\left(x^2-4\right)\left(x^2-1\right)$

(b) $x^4+3x^3+4x^2$

(c) $x^6+7x^4+4x^2$

(d) $x^6+5x^4+4x^2$

(e) $x^6+8x^4+4x^2$

18. The graph of the polynomial function $f(x)=5x^5-4x^3+17x^2+2$ goes:

(a) up to left and down to right with at most 4 turning points

(b) down to left and down to right with at most 1 turning points

(c) down to left and up to right with at most 4 turning points

(d) up to left and up to right with at most 2 turning points

(e) down to left and up to right with at most 5 turning points

19. Which one of the following is a **polynomial** ?

(a) $\dfrac{x+3}{x^2+x+1}$

(b) $x^3+3x^{-1}+2$

(c) 5

(d) $\sqrt{x^2+x+4}$

(e) $x^{2/3}+5x^{1/6}-2$

20. Which one of the following statements is **FALSE?**

(a) If r is a real number, then $\sqrt{r^2}=r$

(b) The set of rational numbers is commutative under multiplication

(c) The set of irrational numbers is not closed under addition

(d) For any real numbers a and b, $|a+b|\le|a|+|b|$

(e) 1 is the only positive integer that is not prime and not composite

21. The expression $\frac{\left(2x^{-2}y^{3}\right)^{-2}\left(-4x^{4}y^{-1}\right)^{3}}{-8x^{-2}y^{2}}$ simplifies to:

(a) $\frac{-2x^{12}}{y^{11}}$

(b) $\frac{x^{10}}{y^{5}}$

(c) $\frac{2x^{18}}{y^{11}}$

(d) $\frac{-2x^{13}}{y^{10}}$

(e) $\frac{3x^{-13}}{y^{-11}}$

22. The solution set of the equation

$$\frac{4x-3}{2x}=\frac{2x-4}{x-2}$$

contains:

(a) two positive integers

(b) one positive integer

(c) one negative integer

(d) no real number

(e) two negative integers

23. If $z=(5-3i)(-2-4i)+\sqrt{-1}\ \sqrt{-4}$ then the **conjugate** $\overline{z}$ is:

(a) $2-14i$

(b) $-24+14i$

(c) $24-14i$

(d) $-24+26i$

(e) $18+14i$

24. The following rational expression

$$\frac{\dfrac{x^2+3x-10}{(x+3)(x-2)}}{\dfrac{(x+5)(x-6)}{2x^2-15x+18}}$$ is equal to:

(a) $3x-2$

(b) $\dfrac{2x+3}{x+3}$

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

(d) $\dfrac{x+3}{2x-3}$

(e) $\dfrac{2x-3}{x+3}$

25. The polynomial $p(x) = 5x^6 + 2x^2 + 4$ has:

(a) no rational zeros

(b) six rational zeros

(c) two rational zeros and four irrational zeros

(d) two rational zeros and four nonreal complex zeros

(e) four rational zeros and two irrational zeros

26. If $p(x) = 5x^{48} + 6x^{10} - 5x + 7$ is divided by $(x - i)$, then the remainder is:

(a) $-13 - i$
(b) $6 - 5i$
(c) $6 + 5i$
(d) $18 - 5i$
(e) $18 + 5i$

27. Which one of the following statements is **FALSE?**

(a) The slope of a horizontal line is zero.

(*b*) The slope m of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_1 - x_2}, \quad x_2 \neq x_1$$

(*c*) The slope of a vertical line is undefined.

(d) Parallel lines have same slopes.

(*e*) Two non-vertical lines are perpendicular if slopes are negative reciprocal of each other.

28. If $f(x) = \sqrt{16 - x^2}$ and $g(x) = x^2 - 7x + 10$, then the domain of $\left(\frac{f}{g}\right)(x)$ is equal to:

(*a*) $[-4,-2) \cup (-2,4]$
(*b*) $(-4,2) \cup (2,4)$
(*c*) $[-4,2) \cup (2,4]$
(*d*) $(-\infty,-4] \cup [-4,\infty)$
(*e*) $(2,4]$