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

**Code 002**

**Math 001, Final Exam**
**Term (011)**
**January 05, 2002**
Time Allowed: 3 Hrs.
From: 7:00 pm to 10:00 pm

**Code 002**

STUDENT NAME:________________________________

ID #:________________________ SECTION #:____________________

**Important Instructions:**

**All types of Calculators, Pagers or Telephones are not allowed during the Examination.**

**Do not put any mark on a choice of any answer on the Exam Paper**

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

1. **Use an HB 2.5 pencil.** Any mistake in bubbling your ID number will cost you one grade point.
2. **Use a good eraser. Do not use the eraser attached to the pencil.**
3. **Write your name, ID number and Mathematics Section number** on the examination paper
4. When bubbling **your ID number and Math Section number**, be sure that bubbles match with the number that you write.
5. **Match the test Code Number** already bubbled in your **answer sheet** with the **Test Code Number** printed on your **question paper.**
6. When erasing a bubble, make sure that you **do not leave any trace of pencilling.**
7. **Check** that the exam paper has 28 questions.

1. The values of K for which the equation $x^2 + Kx + 27 = 0$ has two equal real solutions are:

$(a) \pm 5\sqrt{7}$
$(b) \pm 7\sqrt{2}$
$(c) \pm 6\sqrt{3}$
$(d) \pm 2\sqrt{7}$
$(e) \pm 3\sqrt{5}$

2. If a straight line has $x$-intercept $(\frac{1}{2}, 0)$ and $y$-intercept $(0, -3)$, then it is parallel to the line
$(a)\ y - 6x = -3$
$(b)\ 2y + 6x = -3$
$(c)\ -2y + 6x = -3$
$(d)\ 6y + x = 3$
$(e) -2y + 5x = 7$

3. If $f(x) = 5x^2 - 4x$, then the expression $\dfrac{f(x+h) - f(x)}{h}$ simplifies to

$(a)\ 10x + 5h + 4$

$(b)\ 10x - 5h + 4$

$(c)\ 5x + 5h + 4$

$(d)\ 5x - 5h - 4$

$(e)\ 10x + 5h - 4$

4. If $f(x) = 2x - 1$ and $g(x) = \dfrac{4}{x}$, then $(f \circ g)(k-1) =$

$(a)\ \dfrac{4}{2k-3}$

$(b)\ \dfrac{5+k}{k-1}$

$(c)\ \dfrac{7}{k-1}$

$(d)\ \dfrac{9-k}{k-1}$

$(e)\ \dfrac{4}{2k+3}$

5. If $f(x)=\dfrac{1}{x-2}$ and $g(x)=\sqrt{25-x^2}$, then the domain of $\left(\dfrac{f}{g}\right)(x)$ is

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

$(b)(-5,2)\cup(2,5)$

$(c)\ [-5,5]$

$(d)\ (-5,5)$

$(e)\ (-\infty,2)\cup(2,\infty)$

6. The sum of the roots of the equation $|3x-2|^2=|3x-2|$ is

$(a)\dfrac{1}{3}$

$(b)\ 3$

$(c)\ -4$

$(d)\ 2$

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

7. The lowest degree of a polynomial with real coefficients having the zeros "3 of multiplicity 2, -5, 4+ $i$, 7 – $i$ and 7 + $i$ "is

$(a)$ 7
$(b)$ 6
$(c)$ 5
$(d)$ 8
$(e)$ 9

8. If $f(x) = \frac{2}{x^3+1}$, then $f^{-1}\left(\frac{1}{14}\right)$ is equal to

$(a)\sqrt[3]{11}$
$(b)\ \sqrt[3]{19}$
$(c)3$
$(d)$ 1
$(e)$ 2

9. The graph of the equation $y = \frac{x^2 - 3}{2x}$ is symmetric with respect to

$(a)$ the origin and the $x$-axis only

$(b)$ the $x$-axis only

$(c)$ the $y$-axis only

$(d)$ the $x$-axis and $y$-axis only

$(e)$ the origin only

10. The expression $\frac{|5 - |3\pi - 10|| - (\pi + 1)}{-|\pi - 3|}$ simplifies to

$(a)$ $-2$

$(b)$ $-3$

$(c)$ $-1$

$(d)$ $-4$

$(e)$ $-5$

11. If y = - 3 is a horizontal asymptote for the graph of $f(x)=\frac{Ax^2+x+2}{2x^2-x-1}$, then the vertical asymptote(s) will be

$(a)\, x=1$ and $x=\frac{-1}{2}$

$(b)\, x=1$

$(c)\; x=\frac{1}{2}$

$(d)\; x=-1$

$(e)\; x=-1$ and $x=\frac{-1}{2}$

12. The equation of the slant asymptote for $f(x)=\frac{2x^3+5x^2+1}{x^2+x+3}$ is

$(a)\; y=2x+10$

$(b)\; y=-9x-8$

$(c)\; y=-2x-3$

$(d)\, y=2x+3$

$(e)\; y=-2x+4$

13. The expression $\frac{-2x^2-18}{x^2-64} \div \frac{x^3-3x^2+9x-27}{x^2+5x-24}$ simplifies to

(a) $\frac{1}{x-4}$

(b) $\frac{2}{8-3x}$

(c) $\frac{2}{8-x}$

(d) $\frac{1}{4-x}$

(e) $\frac{3}{8+x}$

14. One factor of $x^2-6xy+9y^2-1$ is

(a) $x+2y-3$

(b) $x^2-1$

(c) $3y-2x$

(d) $x-3y-1$

(e) $x-2y+3$

15. If $p(x) = x^{105} - x^{10} - 2x + 1$ is divided by $x - i$, then the remainder is

$(a)\, 2+2i$
$(b)\ 2+i$
$(c)\ i$
$(d)\, 2-i$
$(e)\ -2+i$

16. The largest negative integer that, by Bound Theorem is a lower bound for the real zeros of the polynomial $k(x) = 4x^4 - 12x^3 - 3x^2 + 12x - 7$ is:

$(a)\, 0$
$(b)\ -1$
$(c)\ -2$
$(d)\ 2$
$(e)\ 3$

17. The polynomial $h(x) = 3x^3 + 7x^2 + 3x + 7$ has at least one real zero in the interval

$(a)\ [-2,-1]$
$(b)\ [-3,-2]$
$(c)\ [-1,0]$
$(d)\ [0,1]$
$(e)\ [1,2]$

18. Given $i$ as a zero of $p(x) = 8x^5 - 12x^4 + 14x^3 - 13x^2 + 6x - 1$, then the other zeros are:

$(a)$ "one nonreal " and "one rational zero of multiplicity 3".
$(b)$ "one nonreal", "one rational " and " two integer zeros"
$(c)$ "one nonreal", "one rational" and " two irrational zeros"
$(d)$ "one nonreal" and "three integer zeros"
$(e)$ "four nonreal zeros".

19. The expression $\left(\frac{x^n y^{2n}}{y^{3-n}}\right)^{-2}$ simplifies to

$(a)\ \frac{y^{6-6n}}{x^{2n}}$

$(b)\ \frac{x^{2n}}{y^{6-6n}}$

$(c)\ \frac{y^{6n}}{x^{2n}}$

$(d)\ \frac{y^{6}}{x^{2n}}$

$(e)\ \frac{x^{2n}}{y^{6+6n}}$

20. Which one of the following statements is TRUE?

$(a)\ (x+4)^2 = x^2+16$ is an identity.

$(b)\ x-3=0$ and $x^2=9$ are equivalent equations.

$(c)\ x(5+x) = x^2+5(x+1)$ is a contradiction.

$(d)\ \frac{6x+1}{3} = 2x+\frac{1}{3}$ is a conditional equation.

$(e)\ (x-3)(x+4) = x^2-x-12$ is an identity.

21. The expression $\frac{2}{2\sqrt{2}-3}+\frac{8}{\sqrt{2}}$ simplifies to

$(a)$ $\frac{-6}{5}$

$(b)$ $6+8\sqrt{2}$

$(c)$ $\frac{-6+16\sqrt{2}}{5}$

$(d)$ $-3+3\sqrt{2}$

$(e)$ $-6$

22. If the product of two consecutive odd positive integers is 195, then the sum of these two numbers is equal to:

$(a)$ 24

$(b)$ 37

$(c)$ 52

$(d)$ 39

$(e)$ 28

23. The **conjugate** of the complex number $\frac{(6+i)^2}{i^{15}}$ is equal to

$(a)$ $-12-35i$

$(b)$ $12-35i$

$(c)$ $-12+35i$

$(d)$ $-35+12i$

$(e)$ $6-i$

24. If the center of the circle $x^2+4x+y^2-6y=-9$ is $(2a+1, 2b-1)$, then the value $ab$ is equal to

$(a)\ \frac{-3}{4}$

$(b)\ -3$

$(c)\ \frac{-4}{3}$ $(d)\ \frac{-1}{3}$

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

25. Let $f(x)=x^2+8x-9$, $x \le -4$. Then $f^{-1}(x)$, its domain $D$ and its range $R$ will be

$(a)\ f^{-1}(x)=-9-\sqrt{x-25}$, $D=(-25,\infty)$ and $R=(-\infty,-4]$.

$(b)\ f^{-1}(x)=-\sqrt{x+25}$, $D=(-25,\infty)$ and $R=(-\infty,\infty)$.

$(c)\ f^{-1}(x)=\sqrt{x+5}$, $D=[-5,\infty)$ and $R=[0,\infty)$.

$(d)\ f^{-1}(x)=(x+4)^2$, $D=$ $R=(-\infty,\infty)$.

$(e)\ f^{-1}(x)=-4-\sqrt{x+25}$, $D=[-25,\infty)$ and $R=(-\infty,-4]$.

26. According to Descartes' rule of signs, the polynomial $p(x)=4x^4-12x^3-3x^2+12x-7$ has

$(a)$ one or three negative real zeros

$(b)$ one negative real zero

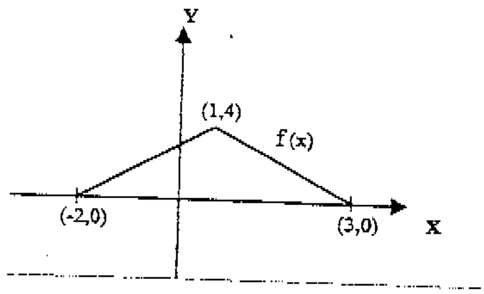
$(c)$ four positive real zeros

$(d)$ no positive real zero

$(e)$ three negative real zeros

27. The graph of a function $y = f(x)$ is shown in the adjacent figure. The domain $D$ and the range $R$ of the function $y = -f(x+1)+2$ are:

(a) $D = [0,\infty)$ and $R = (-\infty,\infty)$
(b) $D = [-2,3]$ and $R = [0,4]$
(c) $D = [0,5]$ and $R = [-4,4]$
(d) $D = [-2,2]$ and $R = [-3,2]$
(e) $D = [-3,2]$ and $R = [-2,2]$




28. If $x_1$ and $x_2$ are the solutions of the equation $3x^{\frac{2}{3}} - 11x^{\frac{1}{3}} - 4 = 0$ and $x_1 > x_2$, then $x_1 + 27x_2 =$

(a) $-65$
(b) $65$
(c) $-62$
(d) $63$
(e) $0$