KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 132 -FINAL EXAM

Wednesday - June 8, 2005

Test Code: 1

Dr. Mohammad Z. Abu-Sbeih TIME: 7:00 - 10:00 P.M.

Serial Number:________________

Student Number:________________ Section Number:______

Name:______________________________________

Important Notes

1. Write your serial number, student number, section number and name on both the answer sheet and question paper.
2. **Calculators of any type are not allowed.**
3. The test code is already typed and bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
4. When bubbling, make sure that the bubbled space is fully covered.
5. Check that the exam paper has 26 different questions on 9 different pages.

(1) The $\lim\limits_{x \to 0^-} \dfrac{|x| - x}{x}$

(a) is equal to 0
(b) is equal to 1
(c) is equal to 2
(d) is equal to -2
(e) does not exist.

(2) The function $f(x) = \dfrac{x^3 - x}{x^2 + x - 2}$ is discontinuous at

(a) 1 and -2
(b) -1 and 2
(c) 1 and -1.
(d) 1, -1, and -2
(e) 1, -1, and 2

(3) If $y = \dfrac{x}{2x-1}$ then $\dfrac{d^2y}{dx^2}$ at $x = 1$ is

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

(4) If $f(x) = x\sqrt{x}$, then $\lim\limits_{h \to 0} \dfrac{f(4+h) - f(4)}{h}$ is equal to

(a) 4
(b) 8
(c) doesn't exist
(d) 3
(e) $\dfrac{3}{2}$

(5) The **average cost** function for a certain product is $\bar{c}(q) = 0.02q^2 - 0.01q + 20 + \dfrac{1000}{q}$. The **marginal cost** when 100 units are produced is equal to

(a) 3.89
(b) 618
(c) 219.1
(d) 600
(e) 38.9

(6) The saving function is $S = 6 + \dfrac{3I}{4} - \dfrac{\sqrt{I}}{3}$, where *I* is the income in billions of dollars. The marginal propensity to consume when the income $I = 25$ is

(a) $\frac{43}{60}$
(b) $\frac{41}{60}$
(c) $\frac{17}{60}$
(d) $\frac{13}{60}$
(e) $\frac{47}{60}$

(7) If $y = \tan(\pi x)$ and $x = \frac{t}{4} + \ln t$ then $\frac{dy}{dt}$ at $t = 1$ is equal to

(a) $\frac{5\pi}{4}$
(b) $\frac{5\pi}{8}$
(c) $\frac{\pi}{2}$
(d) 5π
(e) $\frac{5\pi}{2}$

(8) The slope of the line tangent to the graph of $\ln(xy) + y = 1$ at the point $(1,1)$ is

(a) $-\frac{1}{2}$
(b) $\frac{1}{2}$
(c) -1
(d) 1
(e) 0

(9) If $y = (2+x)^x$ then y' at the point $(1,3)$ is equal to:

(a) $2 + \ln 9$
(b) $1 + \ln 27$
(c) $3 + 3\ln 3$
(d) $\frac{1}{3} + \ln 3$
(e) $\frac{2}{3} + \ln 3$

(10) Which of the following statements is $\boxed{\textbf{false}}$ about the graph of the function $f(x) = 1 + x^{\frac{2}{3}}$.

(a) The graph has absolute minimum at (0, 1).
(b) The graph has one critical number $x = 0$.

(c) The graph is decreasing on the interval $(-\infty,0)$ and is increasing on $(0,\infty)$.
(d) The graph has one inflection point at (0, 1).
(e) The graph is concave down on $(-\infty,0)$ and on $(0,\infty)$

(11) Which of the following statements is **True** about the graph of the function $f(x)=3x^4-4x^3+1$

(a) The graph has relative maximum at $x=0$ and relative minimum at $x=1$.
(b) The graph has relative minimum at $x=0$ and relative maximum at $x=1$.
(c) The graph has one relative minimum and no relative maximum.
(d) The graph has only one asymptote.
(e) The graph has one inflection point.

(12) Which of the following statements is **false** about the graph of the function $f(x)=\dfrac{2x+1}{x-1}$

(a) The graph has a vertical asymptote at $x=1$.
(b) The graph has a horizontal asymptote at $y=2$.
(c) The graph has no critical points.
(d) The graph has no inflection points.
(e) The graph is always concave up.

(13) When we use differentials to calculate the change in the volume *V* of a sphere if the radius *r* is increased from 5 *cm.* to 5.3 *cm.* we get

(a) $3\pi \quad cm^3$.
(b) $300\pi \quad cm^3$.
(c) $300 \quad cm^3$.
(d) $30\pi \quad cm^3$.
(e) $30 \quad cm^3$.

(Note: $V=\dfrac{4}{3}\pi r^3$)

(14) The area of the region enclosed by the graphs of $f(x)=1-x^2$ *and* $g(x)=(1-x)^2$ is equal to:

(a) $\dfrac{1}{3}$
(b) 0
(c) $\dfrac{4}{3}$
(d) $\dfrac{2}{3}$
(e) 1

(15) The demand equation for a certain product is $p=40-4q$ where *p* is the price and *q* is the number of units. **The price *p* which will maximize the revenue is**:

(a) 5
(b) 20
(c) 22
(d) 10
(e) 15

(16) The area of the region bounded by the curve $f(x) = x^2 - 4x + 3$ and the x-axis on the interval [0,3] is equal to:

(a) 0
(b) $\frac{10}{3}$
(c) $\frac{2}{3}$
(d) $\frac{4}{3}$
(e) $\frac{8}{3}$

(17) $\int \left[\frac{1}{x+1} + \frac{1}{(1-x)^2} \right] dx$ is equal to

(a) $\ln|x+1| - \frac{1}{1-x} + C$.
(b) $\ln|x+1| - 2\ln(1-x) + C$.
(c) $\ln|x+1| + 2\ln(1-x) + C$.
(d) $\ln|x+1| + \frac{1}{1-x} + C$.
(e) $\ln\left|\frac{x+1}{1-x}\right| + C$.

(18) $\int_1^e \frac{\ln(x\,e^{2x})}{x}\, dx$ is equal to:

(a) $2e - \frac{3}{2}$
(b) $2e + \frac{3}{2}$
(c) $2e + \frac{5}{2}$
(d) $e + \frac{1}{2}$
(e) $e - \frac{1}{2}$

(19) $\int \frac{\ln x}{x^3}\, dx$ is equal to:

(a) $\dfrac{\ln x}{2x^2} + C$

(b) $\dfrac{\ln x}{2x^2} - \dfrac{1}{4x^2} + C$

(c) $-\dfrac{\ln x}{2x^2} - \dfrac{1}{4x^2} + C$

(d) $-\dfrac{\ln x}{2x^2} + \dfrac{1}{4x^2} + C$

(e) $\dfrac{\ln x}{2x^2} + \dfrac{1}{4x^2} + C$

(20) If $\displaystyle\int \frac{du}{u^2 - a^2} = \frac{1}{2a}\ln\left|\frac{u-a}{u+a}\right| + C$, then $\displaystyle\int \frac{dx}{x^2 - 6x}$ is equal to:

(a) $\dfrac{1}{6}\ln\left|\dfrac{x+6}{x}\right| + C$.

(b) $\dfrac{1}{3}\ln\left|\dfrac{x+6}{x}\right| + C$.

(c) $\dfrac{1}{6}\ln\left|\dfrac{x-3}{x+3}\right| + C$.

(d) $\dfrac{1}{3}\ln\left|\dfrac{x-6}{x}\right| + C$.

(e) $\dfrac{1}{6}\ln\left|\dfrac{x-6}{x}\right| + C$.

(21) $\displaystyle\int \frac{1-\cos x}{\sin^2 x}\,dx$ is equal to:

(a) $\cot x - \csc x + C$.
(b) $\csc x + \cot x + C$.
(c) $\csc x - \cot x + C$.
(d) $-\cot x - \csc x + C$.
(e) $\ln|1 + \cos x| + C$.

(22) The weekly profit, $P(x, y)$, from selling x computers and y printers is given by $P(x, y) = 1000 + 3x^2 - 2xy + y^2 - 8y$. The company will make:

(a) minimum profit when $x = 2$, and $y = 6$.
(b) minimum profit when $x = 3$, and $y = 3$.
(c) maximum profit when $x = 6$, and $y = 4$.
(d) minimum profit when $x = 4$, and $y = 6$.
(e) maximum profit when $x = 2$, and $y = 6$.

(23) The equation of the plane which is parallel to the yz-plane and passes through the point $(-2,3,1)$ is

(a) $y = 3$
(b) $x = -2$
(c) $z = 1$
(d) $3y + 2z = 0$
(e) $-2x + 3y + 2z = 0$

(24) If $f(x, y, z) = \cos(x^2 + xy - 2yz)$ then $f_{xz}(1,1,1)$ is equal to:

(a) 4
(b) -4
(c) 2.
(d) -6
(e) 6

(25) The function $f(x, y) = x^2 + 2xy + 2y^2 - 4y$ has

(a) relative maximum at (-2,2)
(b) relative maximum (2,-2)
(c) relative minimum at (-2,2) and
(d) saddle point at (-2,2)
(e) relative minimum at (2,-2)

(26) **Bonus Problem:** Let $f(x) = k^x - x^k$, where k is a positive constant. Then $f'(1) = 0$ when

(a) $k = 0$ only.
(b) $k = e$ and $k = 0$.
(c) $k = 1$ and $k = 0$.
(d) $k = 1$ only.
(e) $k = 1$ and $k = e$.