King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 101 Fall 2003

Final Exam A Tuesday 13 / 1 / 2004 Time $2\frac{1}{2}$ hours

Name: ______________________I.D.#:___________ Serial #:_______

Section #: 15 17

Answer all the question

For the multiple choice questions put your choice in this table

Quistion #	a	b	c	d	e
1	a	b	c	d	e
2	a	b	c	d	e
3	a	b	c	d	e
4	a	b	c	d	e
5	a	b	c	d	e
6	a	b	c	d	e
7	a	b	c	d	e
8	a	b	c	d	e
9	a	b	c	d	e
10	a	b	c	d	e
11	a	b	c	d	e
12	a	b	c	d	e
13	a	b	c	d	e
14	a	b	c	d	e
15	a	b	c	d	e
16	a	b	c	d	e

Question #	17	18	19	20	21	Total
Grade	/5	/4	/5	/4	/4	/22

1. $\lim_{x} \frac{\sqrt{4x^2 \quad 1}}{3x \quad 2}$

a. $\frac{2}{3}$

b. $\frac{4}{3}$

c. $\frac{4}{2}$

d.

e. $\frac{2}{3}$

2. For the function $f\ x \quad x^4 \quad 2x^3 \quad 3$, then only one of the following is <u>TRUE</u> :

a. At the point $\frac{3}{2}, \frac{21}{16}$, $f\ x$ has relative minimum

b. At the point $0, 3$, $f\ x$ has relative maximum

c. At the point $\frac{3}{2}, \frac{21}{16}$, $f\ x$ has relative maximum

d. At the point $0, 3$, $f\ x$ has relative minimum

e. At the point $\frac{3}{2}, \frac{21}{16}$, $f\ x$ has no relative extrema.

3. Let $f\ x \quad \frac{x^2}{x^3 \quad 3}$. If $f^{\ 1}\ x \quad 2$, then x is equal :

a. $\frac{12}{15}$

b. 1

c. $\frac{8}{5}$

d. $\frac{4}{11}$

e. $\frac{4}{15}$

4. Let the function $f\ x \quad \left\{ \begin{array}{ll} \dfrac{\sin kx}{\sin 3x} & \text{if } x \quad 0 \\ 2 & \text{if } x \quad 0 \end{array} \right\}$. The value of k so that $f\ x$ is continuous at $x \quad 0$ is :

a. 2

b. 4

c. 6

d. 1

e. 3

5. Let $f\ x \quad x^3 \quad 2x^2 \quad 4x \quad 2$. Then the equation of the tangent to the graph of $f\ x$ at $x \quad 1$ is :

a. $y \quad 3x \quad 3 \quad 0$

b. $y \quad 3x \quad 2 \quad 0$

c. $y \quad 3x \quad 2 \quad 0$

d. $y \quad 3x \quad 4 \quad 0$

e. $y \quad 3x \quad 3 \quad 0$

6. $\lim\limits_{x} \dfrac{3x \quad x\sin 5x}{x^2 \quad 2x \quad 3}$

a. 0

b. 3

c. does not exist

d. 1

e.

7. $\lim\limits_{x \quad 1} \dfrac{3^x \quad 3}{x \quad 1}$

a. $\ln 3$

b. 3^3

c. $\ln 3^2$

d. 3

e. $3\ln 3$

8. Let $f\ x \quad \begin{cases} ax^2 \quad b & \text{if } x \quad 1 \\ 4x & \text{if } x \quad 1 \end{cases}$, for $f\ x$ to be differentiable at $x \quad 1$, the values of a and b satisfy that $a \quad 2b$ is equal to :

a. 2

b. 5

c. 3

d. 6

e. 4

9. Let $f\ x \quad ke^x$, then the value of k so that the line $y \quad ex$ is tangent to $f\ x$ is:

a. 2

b. 3

c. 1

d. 2

e. 1

10. Given $f\ \ x \quad \frac{3}{x^2 \quad 1}$, and $g\ x \quad \sqrt{2x \quad 3}$. Let $F\ x \quad f\ g\ x$, then $\frac{dF\ x}{dx}$:

a. $\frac{2}{x \quad 2\ \sqrt{2x \quad 3}}$

b. $\frac{3}{2x \quad 4\ \sqrt{2x \quad 3}}$

c. $\frac{6}{2x \quad 3\ \sqrt{2x \quad 3}}$

d. $\frac{1}{x \quad 3\ \sqrt{2x \quad 3}}$

e. $\frac{1}{2x \quad 1\ \sqrt{2x \quad 3}}$

11. A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 4 *ft*/*s* . Then the rate a which the area enclosed by the ripple increasing at the end of 8 *seconds* is:

a. 256 .

b. 128 .

c. 16 .

d. 32 .

e. 512 .

12. The radius r of a sphere is measured with a percentage error of 0.03% . Then the estimated percentage error in the calculated surface area S of the sphere is : (where $S \quad 4 \;\; r^2$

a. 0.09%

b. 0.06%

c. 0.03%

d. 0.6%

e. 0.3%

13. Let $f\,x \quad 3x^3 \quad 3x \quad 4$, then $\frac{df^{\;1}\;2}{dx}$:

a. $\frac{1}{2}$

b. $\frac{1}{26}$

c. $\frac{1}{12}$

d. $\frac{1}{39}$

e. $\frac{1}{16}$

14. If $y \quad \sec^{\;1}\; 2x^3$, then $\frac{dy}{dx}$ is equal to :

a. $\frac{1}{|2x^3|\sqrt{4x^6 \quad 1}}$

b. $\frac{1}{|2x^3|\sqrt{1 \quad 4x^6}}$

c. $\frac{3}{|x|\sqrt{4x^6 \quad 1}}$.

d. $\frac{1}{|x|\sqrt{4x^6 \quad 1}}$.

e. $\frac{3}{\sqrt{1 \quad 4x^6}}$.

15. $\lim_{x \quad 0} \frac{1}{x} \quad \frac{1}{e^x \quad 1}$:

a. does not exist

b. 1

c. $\frac{1}{2}$

d. 2

e. 1

16. Let $f\, x \quad x^{\frac{2}{3}}\ 6 \quad x \ ,x \quad 1,8$, then :

a. The absolute minimum of $f\,x$ is 8.

b. The absolute maximum of $f\,x$ is $4\sqrt[3]{2}$.

c. The absolute minimum of $f\,x$ is 0.

d. The absolute minimum of $f\,x$ is 21.

e. The absolute maximum of $f\,x$ is 6.

SOLVING PART

17. Find the dimensions of the rectangle of maximum area that can be inscribed in a semicircle of radius 10. One side of the rectangle is to sit on the diameter of the semicircle.

18. Use the mean value theorem to show that $\tan x \quad x$, for $0 \quad x \quad \overline{\ \ 2}$

19. graph the function showing all neccessary details, where

$f\,x \quad \frac{x^2 \quad 1}{x^3}$, and if $f\,x \quad 0$ then $x \quad 1$ or 1,

$f\ \ x \quad \frac{3 \quad x^2}{x^4}$, and if $f\ \ x \quad 0$ then $x \quad \sqrt{3}$ or $\sqrt{3}$

$f\ \ x \quad \frac{2\ x^2 \quad 6}{x^5}$, and if $f\ \ x \quad 0$ then $x \quad \sqrt{6}$ or $\sqrt{6}$

$f\sqrt{3} \quad 0.4$, $f \quad \sqrt{3} \quad 0.4$, $f\sqrt{6} \quad 0.34$, $f \quad \sqrt{6} \quad 0.34$

20. Let $f\,x \quad y \quad f\,x \quad f\,y \quad 3xy$, and $\lim_{h \quad 0} \frac{f\,h}{h} \quad 7$. Find $f\ \ x$.

21. $\lim_{x \quad 0} \sin x^{\frac{2}{\ln x}}$