Final Exam – Math 101
Section 22

Q1. Let $g\ x \quad x^2 \quad \sqrt{8 \quad x^3}$ .Find $g \quad x$ and $g \quad 1$.

6 points

Q2. Determine whether the limit exists or not:

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

5 points

Q3. $\dfrac{\cos 2x}{\sqrt{1 \quad \sin 2x}}\ dx$

5 points

Q4. A stone is thrown upward ,it takes 8 seconds to reach the surface of the ground again

a. Find the maximum height the stone could attain.

b. What is the speed of the stone 2 seconds after it is thrown?

use g 32 ft

6 points

Q5. Find the values of a and b so that the following function is continuous at $x \quad 2$

$$f\,x \quad \left\{ \begin{array}{lll} x^2 \quad ax \quad 2 & \text{if} & x \quad 2 \\ 5 \quad b & if & x \quad 2 \\ bx \quad 4 & if & x \quad 2 \end{array} \right\}$$

6 points

Q6. Sketch the function with the following properties:

$f\,x \quad \dfrac{x^2}{x^2 \quad x \quad 6} \quad \dfrac{x^2}{x \quad 3 \quad x \quad 2}$,$f\,x \quad 0,\quad if \quad x \quad 0$

$f \quad x \quad \dfrac{x^2 \quad 12x}{x^2 \quad x \quad 6 \quad ^2}$, $and \quad f \quad x \quad 0,\quad if \quad x \quad 0 \quad or \quad x \quad 12$

$f \quad x \quad \dfrac{2x^3 \quad 36x^2 \quad 72}{x^2 \quad x \quad 6 \quad ^3},\quad and \quad f \quad x \quad 0,\quad if \quad x \quad 18.11$

$f\,0 \quad 0,\quad f\,12 \quad 0.960,\quad f\,18.11 \quad 0.964$

Show assymtotes and give table of signs of $f \quad x \quad \& \quad f \quad x$.

6 points

Q7. Evaluate the integrals :

5 points each

a. $\overset{2}{\underset{1}{}} \; 1 \quad \frac{1}{x} \;{}^{2}\; \frac{1}{x^2} \, dx$

b. $\overset{3}{\underset{3}{}} \; 4 \quad \sqrt{9 \quad x^2}$

Q8. .

6 points

Q9. Let $f\,x \quad x\sqrt{4 \quad x^2}$. Find the local extrema of $f\,x$ and the intervals where $f\,x$ is increasing or decreasing , and sketch the graph of $f\,x$.

7 points

Q10. If $f\,x \quad 2\sin x \quad \cos 2x$, find equations of tangent and normal lines to the graph of $f\,x$ at the point $(\frac{}{4}, \frac{2}{\sqrt{2}}$.

5 points

Q11. $\lim\limits_{x \quad 0} \frac{3x \quad 1 \quad \cos^2 x}{\sin x}$

6 points

Q12. A merchant sells shoes at 100 Riyals per pair if fewer than 10 pairs ordered .If 10 or more pairs are ordered (up to 50) , the price per pair is reduced by one Riyal times the number ordered . What size order will produce the maximum amount of money for the wholesaler ?

6 points

Q13.

6 points

FINAL

A **MULTIPLE CHOICE PART**

18. Let $f\,x \quad x^3 \quad 3x^2 \quad 5 \;\; , x \quad 1, 2$. Then the absolute maximum of the function is:

a. 12

b. 4

c. 5

d. 3

e. 6

19. If $x \quad \sin xy$, then $\frac{dy}{dx}$ equals to:

a. $\frac{1 \quad y\cos xy}{x\cos xy}$

b. $\frac{1 \quad y\cos xy}{x\cos xy}$

c. $\frac{1}{x\cos xy}$

d. $\frac{1}{x\sin xy}$

e. $\frac{x\cos xy}{1 \quad y\cos xy}$

A

20. For the graph of the function $f\,x \quad x^4 \quad 2x^3 \quad 8x \quad 5$, one of the following is <u>FALSE</u>:

a. There is an inflection point at $x \quad 0$.

b. There is an inflection point at $x \quad 1$.

c. There is an inflection point at $x \quad 2$.

d. The graph is concave up in the interval $0, \quad$.

e. The graph is concave down in the interval $1, 0$.

21. $\lim_{x \quad 3} \frac{\frac{1}{x^2} \quad \frac{1}{9}}{x \quad 3}$

a. $\frac{2}{27}$.

b. $\frac{2}{27}$.

c. $\frac{1}{9}$.

d. $\frac{1}{9}$.

e. 6.

A

22. The velocity of a moving particle is $v\ t \quad t^2 \quad 2t \quad 3\ ,\ t \quad 0,4$ .Then the distance that the particle has travelled is equal to :

a. $\frac{20}{3}$.

b. $\frac{20}{3}$.

c. $\frac{28}{3}$.

d. 6.

e. $\frac{34}{3}$.

23. $\int_{0}^{\overline{\ 2}} \frac{\cos x}{\sqrt{1 \quad \sin x}} dx$

a. $\sqrt{2} \quad 1$.

b. $\frac{1}{\sqrt{2}} \quad 1$.

c. $2\sqrt{2} \quad 2$.

d. $2\sqrt{2} \quad 2$.

e. $\sqrt{2} \quad 1$.

A

24. The shortest distance between the point $P \; 1,0$ and the line $y \quad 4 \quad 2x$ is equal to:

a. $\frac{2}{\sqrt{5}}$.

b. 1.

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

d. $\frac{1}{\sqrt{5}}$.

e. 0.

25. $\,_{1}^{4} \; \frac{15 \; x \quad 1 \;^{2}}{\sqrt{x}} dx$

a. 540.

b. 270.

c. 96.

d. 76.

e. 81.

A

26. For the function $f \; x \qquad \sin 2x \quad x \;, x \qquad 0, 2$. Then all the critical numbers are:

a. $\frac{5}{6}\;,\frac{2}{3}\;,\frac{4}{3}\;,\frac{7}{6}$.

b. $\frac{}{3}\;,\frac{2}{3}\;,\frac{4}{3}\;,\frac{5}{3}$.

c. $\frac{}{3}$, $\frac{}{6}$, $\frac{}{2}$, $\frac{5}{3}$.

d. $\frac{}{6}$, $\frac{5}{6}$, $\frac{7}{6}$, $\frac{}{2}$.

e. 0 , $\frac{}{2}$, $\frac{3}{2}$, $\frac{2}{3}$.

27. The integral $\int_{1}^{2} 3x \quad 1 \quad x \quad 1^{10} dx$ (after a suitable substitution) is equivalent to the integral :

a. $\int_{0}^{1} u^{10}\ 3u \quad 1\ du.$

b. $\int_{1}^{7} u\ u \quad 1^{10} du.$

c. $\int_{0}^{1} u^{10}\ 3u \quad 4\ du.$

d. $\int_{1}^{2} u^{10}\ 3u \quad 1\ du.$

e. $\int_{1}^{2} u^{10}\ 3u \quad 4\ du.$

A

28. If $g\ x \quad \sqrt{x} f\ x$, and $f\ 1 \quad 4$, $f \ 1 \quad 5$, then $g \ 1$ is equal to:

a. 3.

b. $\frac{5}{2}$.

c. 5.

d. 4.

e. 20.

29. The equation of the tangent line to the curve $f\ x \quad \frac{x}{1 \quad x^2}$ at $x \quad 2$ is equal to:

a. $3y \quad 3x \quad 8 \quad 0.$

b. $9y \quad 5x \quad 16 \quad 0.$

c. $3y \quad 3x \quad 8 \quad 0.$

d. $9y \quad 5x \quad 16 \quad 0.$

e. $y \quad 9x \quad 4 \quad 0.$

30. $\mathop{\mathrm{A}}_{k\ 1}^{10} k^3 \quad 5k \quad 2$

a. 1300.

b. 2770.

c. 5540.

d. 1385.

e. 948.

31. For the graph of the rational function $f\ x \quad \frac{x}{x^2 \quad 1}$,one of the following is <u>TRUE</u> :

a. $y \quad 1$ is a horizontal asymptote.

b. $x \quad 1$ is a vertical asymptote.

c. Has one oblique asymptote.

d. Has no asymptote at all.

e. $y \quad 0$ is a horizontal asymptote.

A

32. The function $f\,x \quad x^4 \quad 2x^2 \quad 3$,has:

a. one real zero ,only.

b. two real zeros , only.

c. no real zero.

d. three real zeros ,only.

e. four real zeros ,only.

33. The limit $\lim\limits_{h \quad 0} \dfrac{2 \quad 3h^{\ 2} \quad 4}{h}$ represents the derivative of $f\,x \quad 3x^2$ at x equals to:

a. 2.

b. 6.

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

d. 4.

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

SOLVING PART — SHOW ALL OF YOUR WORK

34. If $y \quad \tan\ \sin x$,then find y” .

35. Use differential to approximate the change in the volume dV of a cube with side length S equals 10 cm ,and the estimated change in the surface area dA is $0.36\ cm^2$ .Where $V \quad S^3$ and $A \quad 6S^2$.

36. Evaluate the integral $\int_{0}^{2} x\sqrt{16 \quad x^4}\; dx$.

37. Give the following information (if exist) in the assigned space about the graph of the function $f\,x \qquad x^{\frac{1}{3}}\;\; x \quad 1$:

-The critical numbers are x _________________ .

-Relative maximum at x _________________ .

-Relative minimum at x _________________.

-Inflection point(s) at x _________________.

-The function is increasing on the interval(s) _________________

-The function is decreasing on the interval(s) _________________

-The function is concave up on the interval(s) _________________

-The function is concave down on the interval(s) _________________

Test 2 Math 101-1 Sum 2001

Instructions:

Show all of your work

All questions have equal grades

1. Find the slope of the tangent to the curve $y \quad 2x \quad 1^{\frac{4}{3}} \quad \sec^3\sqrt{x^3 \quad 1}$, at $x \quad 1$.
2. Let $S\,t \quad 2t^3 \quad 3t^2 \quad 12t \quad 10$, $t \quad 3,3$, be a position function of a particle moving along a coordinate line. on the interval $3,3$, describe where the particle moves to the right or left , and sketch a diagram describing the motion.

3. Let $f\,x \quad x^{\frac{4}{3}} \quad 4x^{\frac{1}{3}}$, find all the critical numbers. Give the intervals where $f\,x$ is
   a. Increasing
   b. Decreasing
   c. Concave up
   d. Concave down.
4. Let $f\,x \quad x^4 \quad 4x^2$, sketch a complete graph of $f\,x$ showing symmetry, increasing - dcreasing , concavity , and relative extrema.
5. Find the points on the parabola $y \quad 2x^2$, closest to the point $P\;1,0$.
6. water is running out of an inverted conical tank so that the height of the water is changing at a rate of $2ft/\min$. At what rate the volume is changing when the height of the water is $6ft$. The height of the tank is $10ft$ and the radius of the tank is $5ft.$ $V \quad \frac{\ }{3}r^2h$
7. If y is defined implicitly by $x^2y \quad xy^2 \quad 2$,then estimate the change in y at the point $P\;1,1$,if x changes from 1 to 0.9.
8. Use Newton's method to approximate where the two graphs $y \quad x$, and $y \quad \cos x$ intersect.
9. Find $\frac{d}{dx} f\,5\sqrt{x}$ if $\frac{df\,x}{dx} \quad 2x^2$.
10. Find all the critical numbers of $f\,x \quad \cos 2x \quad 2\cos x \;\; x \quad 0,2$.

Quize #3A Math 101 - 15 Sem 031

Q1 $\lim_{x \; 0} \frac{x \quad \sin 2x}{\sin x}$

Q2 Find the point(s) at which the function $f\,x \quad \frac{x \quad 3}{|x| \quad 3}$ is not continuous.

Q3. Determine if $f\,x \quad \frac{1}{x\,x^2 \quad 1}$ has any zero in the interval $1,2$

Quize #3B Math 101 - 15 Sem 031

Q1 $\lim_{x \; 0} \frac{\sin x \quad x}{\sin 2x}$

Q2 Find the point(s) at which the function $f\,x \quad \frac{x \quad 2}{|x| \quad 2}$ is not continuous.

Q3. Determine if $f\,x \quad \frac{1}{x\,x^2 \quad 2}$ has any zero in the interval $1,1$

Quize #3A   Math 101 - 17   Sem 031

Q1 $\lim_{x} \; x \;\; 1 \quad \cos\frac{1}{x}$

Q2 Find the value of k at which the function $f\,x \quad \begin{cases} \dfrac{\sin x \quad 3}{x^2 \quad 9} & x \quad 3 \\ k & \text{if } x \quad 3 \end{cases}$ is continuous at $x \quad 3$.

Q3. Determine if $f\,x \quad x^3 \quad x^2 \quad 1$ has any zero in the interval $1, 1$

Quize #3B   Math 101 - 17   Sem 031

Q1 $\lim_{x} \; x \sin\frac{1}{x}$

Q2 Find the value of k at which the function $f\,x \quad \begin{cases} \dfrac{\sin x \quad 2}{x^2 \quad 4} & x \quad 2 \\ k & \text{if } x \quad 2 \end{cases}$ is continuous at $x \quad 2$.

Q3. Determine if $f\,x \quad x^3 \quad 2x \quad 2$ has any zero in the interval $3, 1$

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Department of Mathematical Sciences

Fall 2001-2002   Jan. 8 / 2002

MATH 101 – Final Exam   TIME :

2 hrs & 30 minutes

Dr.Adnan Al-Shakhs

1. If $\cos xy \quad y^2 \quad x \quad 2$, then y at the point $P\; 0, 1$ is equal to :
- **a.** $\frac{1}{2}$
- **b.** 0
- **c.** -2
- **d.** 3
- **e.** 1

2. $\lim_{x} \dfrac{\sqrt{x^2 \quad 4}}{2x \quad 1}$
- **a.** $\frac{1}{2}$
- **b.** $\frac{1}{4}$
- **c.** 0

d.

e. -

3. If $f\,x \qquad 3^{x^2} \quad e^{\sqrt{x}}$, then $f\ \ 1$ is equal to:

a. $6\ln 3 \quad \frac{e}{2}$

b. $\ln 3 \quad e$

c. $6\ln 3 \quad e$

d. $\ln 3 \quad \frac{e}{\sqrt{2}}$

e. $3 \quad e$

4. Let $g\,x \qquad \cos 2x \quad x\,,\ x \qquad 0, 2$. Then all the critical points are at x equals to:

a. $\frac{7}{12}\ ,\ \frac{11}{12}\ ,\ \frac{19}{12}\ ,\ \frac{23}{12}$

b. $\frac{2}{3}\ ,\ \frac{5}{3}\ ,\ \frac{8}{3}\ ,\ \frac{11}{3}$

c. $\frac{}{6}\ ,\ \frac{5}{6}\ ,\ \frac{7}{3}\ ,\ \frac{11}{6}$

d. $\frac{}{12}\ ,\ \frac{5}{12}\ ,\ \frac{7}{12}\ ,\ \frac{13}{12}$

e. $0\ ,\ \frac{}{4}\ ,\ \frac{}{2}\ ,$

5. $\lim\limits_{x \quad 0} \cos x^{\frac{1}{x^2}}$

a. $\frac{1}{\sqrt{e}}$

b. e

c. 1

d. 0

e. e^2

6. Let $f\,x \qquad x^3 \quad 12x \quad 1\ ,\ x \qquad 3, 3$, then the absolute maximum of over the interval is equal to :

a. 17

b. 27

c. 5

d. 1

e. 10

7. $\lim\limits_{h \quad 0} \frac{3^h \quad 1}{h}$

a. $\ln 3$

b. 3

c. 0

d. 1

e. -1

8. Let $f\,x \qquad \begin{Bmatrix} \dfrac{\tan 2x}{ax} & \text{if } x \quad 0 \\ \\ \dfrac{x}{\sqrt{x \quad 1} \quad 1} & \text{if } x \quad 0 \end{Bmatrix}$,

then the limit of f exist at $x \quad 0$, if a equals to:

a. 1
b. 2
c. 0
d. -1
e. -2

9. If $y \quad \sin^{1} \cos x$, then y at $x \quad \frac{}{2}$ is:

a. $\quad 1$
b. 0
c. $\frac{}{2}$
d. $1-\frac{}{2}$
e. 1

10. The motion of a particle is described by the function $S\ t \quad t^2 \quad t \quad 2\ ,\ t \quad\quad 1,3$. Then one of the following is FALSE :

a. The particle is slowing down over the interval $\frac{1}{2},3$.
b. The particle moves to the right over the interval $(\frac{1}{2},3$.
c. The particle moves to the left over the interval $1,\frac{1}{2}$
d. the particles stops at $t \quad 0$
e. $S \quad 1 \quad\quad 0$

11. Let $f\,x \quad \frac{x}{x^2 \quad 4}$, then one of the following is FALSE :

a. f is increasing over the interval $2,2$
b. The graph of f is symmetric about the origin
c. f has only one $x \quad intercept$.
d. $\lim_{x} f\,x \quad 0$
e. $\lim_{x \quad 2} f\,x$

12. If $\frac{dg\ 5x}{x} \quad 2x$, then $\frac{dg\ u}{du}$ is equal to

a. $\frac{2u}{25}$
b. $10u$
c. $\frac{2}{5}u$
d. $5u$
e. $\frac{5}{2}u$

13. One of the following statements is FALSE:

a. $\cos^{1}\frac{1}{2} \quad \frac{}{3}$
b. If $f\,x \quad \sec x$, then $f\ x \quad \sec x \tan x$
c. $\frac{d}{dx}\tan^{1}x \quad \frac{1}{1 \quad x^2}$
d. If $y \quad f\,x$, then $dy \quad f\ x \quad x$
e. If $f\,x \quad x^2\ ,x \quad\quad ,0$. Then $f^{1} \quad \sqrt{x}$

14. The slope of the tangent line to the graph of $f\,x \quad x^3 \quad \ln x^2$ at $x \quad 1$ is:

a. 5
b. 1
c. 0
d. 3
e. 2

15. Let $g\ x \quad x^3 \quad 3x^2 \quad 9x \quad 2$, then the graph of $g\ x$:
a. has relative maximum at $x \quad 3$
b. is increasing over the interval $\quad , \ 3$
c. is decreasing over $0, 1$
d. is having an inflection point at $x \quad 1$
e. $\lim_{x} g\ x$

16. Let $f\ x \quad \frac{x^3}{x^2 \quad 4}$, then the value of a such that $f^{\ 1}\ a \quad 2$ is:
a. -1
b. 1
c. 0
d. 2
e. 8

17. Let $y \quad x^5 \quad 2x^3 \quad 4x$, then $\frac{dx}{dy}$ at the point $1, 7$ is equal to :
a. $\frac{1}{15}$
b. 7
c. 15
d. 1
e. -3

18. Find a point on the curve $x \quad 2y^2$ closest to $0, 9$

19. Let $f\ x \quad x^{\frac{4}{3}} \quad x^{\frac{1}{3}}$. Discuee increase and decrease, and concavity of *f*, locate all extrema and sketch the graph of *f*.

20. A man 1.8 *m* tall is walking at the rate of 2 *m/s* away from a street light 6 *m* high. At what rate is his shadow length changing?

21. Find the equation of the tangent to the curve $y \quad e^x$ that passes through the origin.

KFUPM — Math Dept

MATH 101-1 Summer 2001 Quize 4 A

(4pts)1. A spherical balloon is to be deflated so that its radius decreases at a constant rate of 15 *cm* / min . At what rate must air be removed when the radius is 9 *cm*.

(3pts)2. For $f\ x \quad x^{\frac{4}{3}} \quad 6x^{\frac{1}{3}}$, find the critical numbers , the intervals at which $f\ x$ is increasing , or decreasing . Discuss concavity.

(3pts)3. Let $f\ x \quad x \quad \cos x$, find the x *coordinates* of the relative extrema ,if exist.