MATH 131 **PRACTICE FINAL EXAM** **FALL 2003**

1. Find $\lim_{x \to \pi} \frac{x}{\cos(x)}$.

$A)\, 0 \quad B)\, 1 \quad C)\, \frac{1}{2} \quad D)\, \pi \quad E)\, -1 \quad F)\, 1/3 \quad G)\, -\pi \quad H)\, -\frac{1}{2} \quad I)\, \infty \quad J)\, -\infty$

2. At time t=0 (in seconds) a particle moves along a straight line . If the formula for its position is given by $s = 16t^2 - 32t$, meters . What is its velocity after 3 seconds ?

A) 16 m/s B) 24 m/s C) 32 m/s D) 40 m/s E) 48 m/s F) 56 m/s G) 64 m/s
H) 72 m/s I) 80 m/s J) 88 m/s

3. Find $\lim_{x \to 0} \frac{\tan^{-1}(4x)}{\sin(3x)}$.

$A)\,0$ $B)\,1$ $C)\,\frac{1}{2}$ $D)\,\frac{1}{3}$ $E)\,\frac{2}{3}$ $F)\,\frac{3}{4}$ $G)\,2$ $H)\,\frac{4}{3}$ $I)\,\infty$ $J)\,-\infty$

4. Find the <u>absolute maximum</u> for the function $f(x) = x^3 - 3x + 1$ on the interval $[0, 3]$.

$A)\,11$ $B)\,13$ $C)\,15$ $D)\,17$ $E)\,19$ $F)\,21$ $G)\,23$ $H)\,25$ $I)\,29$ $J)\,27$

5. Suppose $y = (3 + \cos(x))^2$. Find the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$.

A) 0 *B)* 2 *C)* -2 *D)* 4 *E)* -4 *F)* 6 *G)* -6 *H)* 8 *I)* -8 *J)* 10

6. On what intervals is the function $f(t) = t^3 - 27t + 12$ <u>decreasing</u> ?

A) $t < 0$ *B)* $-1 < t < 1$ *C)* $t > 2$ *D)* $-2 < t < 2$ *E)* $t > 3$
F) $t > 1$ *G)* $-3 < t < 3$ *H)* $t > 4$ *I)* $-4 < t < 4$ *J)* $t < -4$

7. If 2700 cm^2 of material is available to make a box with a square base and an open top , find the **length of the base** which gives the **largest possible volume** of the box .

A) 20 cm
B) 25 cm
C) 30 cm
D) 35 cm
E) 40 cm
F) 45 cm
G) 50 cm
H) 55 cm
I) 60 cm
J) 65 cm

8 . What is the <u>slope</u> of the tangent line to the curve $x^3y^3 + x = 2$ at the point $(1, 1)$.

$A)$ 1

$B)$ -1

$C)$ $\frac{2}{3}$

$D)$ $-\frac{2}{3}$

$E)$ $\frac{1}{4}$

$F)$ $-\frac{1}{4}$

$G)$ $\frac{3}{4}$

$H)$ $-\frac{3}{4}$

$I)$ $\frac{4}{3}$

$J)$ $-\frac{4}{3}$

9. List all the <u>critical numbers</u> of the function $y = \sqrt[3]{x^3 - 3x}$.

A) $x = 0, 1$
B) $x = -1, 1$
C) $x = -1, 0, 1$
D) $x = 0, 1, 2$
E) $x = -\sqrt{2}, -1, 0, 1, \sqrt{2}$
F) $x = -\sqrt{2}, -1, 1, \sqrt{2}$
G) $x = -3, -1, 0, 1, 3$
H) $x = -\sqrt{3}, -1, 1, \sqrt{3}$
I) $x = -\sqrt{3}, 0, \sqrt{3}$
J) $x = -\sqrt{3}, -1, 0, 1, \sqrt{3}$

10. Use logarithmic differentiaion to calculate $f'(2)$ for $y = f(x) = x^{1/x}$.

$A)\ \frac{\sqrt{2}}{4}\,(1 - ln(2))$

$B)\ \frac{\sqrt{2}}{2}\,(2 - ln(2))$

$C)\ \frac{\sqrt{2}}{ln(2)}\,(ln(2) - 2)$

$D)\ \frac{ln(2)}{\sqrt{2}}\,(ln(2) - 2)$

$E)\ \frac{3}{\sqrt{2}}\,(1 + ln(2))$

$F)\ 2\sqrt{2}\,(1 - ln(2))$

$G)\ 3\sqrt{2}\,(ln(2) - 1)$

$H)\ 4\sqrt{2}\,(2 - ln(2))$

$I)\ \frac{3\sqrt{2}}{3}\,(1 + ln(2))$

$J)\ \frac{4\sqrt{2}}{3}\,(ln(2) - 1)$

11. If $f(x) = \frac{e^x}{1+x^2}$, find an equation for the tangent line at $x = 0$.

A) $y = x$
B) $y = x + 1$
C) $y = 2x + e$
D) $y = e\,x + 1$
E) $y = \frac{1}{2}x + e$
F) $y = \frac{1}{2}x - e$
G) $y = 2x - 1$
H) $y = \frac{1}{2}x + 1$
I) $y = e\,x - e$
J) $y = 2x + 1$

12. Find the **slope** of the tagent line to the curve $y = 10^{1-x^2}$ at $x = 1$.

A) ln(10)
B) 2 ln(10)
C) 3 ln(10)
D) - ln(10)
E) - 2 ln(10)
F) 1/ln(10)
G) 2/ln(10)
H) 3/ ln(10)
I) -2 /ln(10)
J) -3/ln(10)

13. Approximate $\int_0^6 \frac{1}{x+1}\,dx$, by using the <u>Riemann Sum</u> with $n = 3$ and sample points being the midpoints .

$A)\ 13/7$ $B)\ 15/8$ $C)\ 11/6$ $D)\ 9/7$ $E)\ 13/5$ $F)\ 12/7$ $G)\ 15/9$ $H)\ 12/9$
$I)\ 11/9$ $J)\ 12/5$

14. Suppose we take the interval [1 , 3] and partition it into n equal subintervals . Then we choose sample points , x_i^* , in each of the intervals . If Δx represents the width of each interval then **calculate** the exact value of

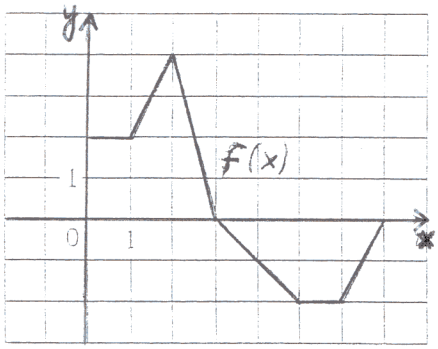
$$\lim_{n\to\infty} \sum_{i=1}^{n} \frac{3}{2}(x_i^*)^2 \ \Delta x,$$

by viewing it as a definite integral .

$A)\ 9\frac{1}{2}$ $B)\ 10$ $C)\ 10\frac{1}{2}$ $D)\ 11$ $E)\ 11\frac{1}{2}$ $F)\ 12$ $G)\ 12\frac{1}{2}$ $H)\ 13$ $I)\ 13\frac{1}{2}$ $J)\ 14$

15. The graph of f(x) is shown below . Using the interpretation of the definite integral in terms of area , evaluate

$$\int_0^7 f(x)\,dx \ .$$



A) 0

B) $\frac{1}{2}$

C) 1

D) $1\frac{1}{2}$

E) 2

F) $2\frac{1}{2}$

G) 3

H) $3\frac{1}{2}$

I) 4

J) $4\frac{1}{2}$

16. Evaluate $\int_1^4 \frac{2t^2 + 3t^2\sqrt{t} - 4}{t^2} \, dt$.

A) 1 B) 3 C) 5 D) 7 E) 9 F) 11 G) 13 H) 15 I) 17 J) 19

17. If $h(x) = \int_1^{1/x} \sqrt{1 + t^3}\, dt$, then evaluate $h'(\frac{1}{2})$, by using part 1 of the Fundemental Theorem of Calculus .

$A)\ 4/\sqrt{3}$

$B)\ -5$

$C)\ 6/\sqrt{3}$

$D)\ -7$

$E)\ 7/\sqrt{2}$

$F)\ -8$

$G)\ 9/\sqrt{2}$

$H)\ -10$

$I)\ 11/\sqrt{2}$

$J)\ -12$

18. A particle moves along a straight line and its velocity at time t is given by, $v(t) = t^2 - t - 2$ m/s. Find the **displacement**, in meters, of the particle in the time period $0 \leq t \leq 3$, seconds.

A) 1/2
B) 3/2
C) 1/6
D) 7/6
E) 13/6
F) $-1/2$
G) $-3/2$
H) $-1/6$
I) $-7/6$
J) $-13/6$

19. Find the **total distance** traveled, in meters, by the particle in problem 18, above, over the same time period.

A) 1/2
B) 3/2
C) 5/2
D) 5/6
E) 11/6
F) 31/6
G) 17/6
H) 11/3
I) 13/3
J) 17/3

20. Evaluate $\int_{e}^{e^4} \frac{dx}{x \cdot \sqrt{ln(x)}}$.

$A)$ 1
$B)$ -1
$C)$ $1 + \frac{1}{e}$
$D)$ 2
$E)$ -2
$F)$ e
$G)$ $\frac{1}{e}$
$H)$ $2e$
$I)$ $\frac{1}{2}$
$J)$ $\frac{1}{2e}$