Multiple Choice

1.(6 pts.) Find the limit $\lim_{x\to 1} \dfrac{\sin(x-1)}{x-1}$.

(a) 0 (b) -1 (c) 1 (d) $+\infty$ (e) Does not exist.

2.(6 pts.) Find the limit $\lim_{x\to 0} \dfrac{\sqrt{x+9}-3}{x}$.

(a) -3 (b) $\dfrac{1}{6}$ (c) $\dfrac{1}{3}$ (d) 3 (e) Does not exist

3.(6 pts.) If f and g are two continuous functions with $f(1) = 2$ and $\lim_{x\to 1}[3f(x) + g(x)] = 6$, find $g(1)$.

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

4.(6 pts.) For what value of the constant c is the function f continuous on $(-\infty, \infty)$ where $f(x) = cx + 1$ for $x \le 2$, $f(x) = cx^2 - 1$ for $x > 2$?

(a) 2 (b) -1 (c) 3 (d) 4 (e) 1

5.(6 pts.) Find an equation for the tangent line to the curve $y = \dfrac{1}{\sqrt{x}}$ at the point $(1, 1)$.

(a) $2y = -x - 3$ (b) $2y = -x + 3$ (c) $2y = x - 3$ (d) $2x = -y + 3$

(e) $2y = x + 3$

6.(6 pts.) If $f(3) = 4$, $g(3) = 2$, $f'(3) = -6$ and $g'(3) = 5$, find $\left(\dfrac{f}{g}\right)'(3)$.

(a) -1 (b) -8 (c) 8 (d) 0 (e) $\dfrac{1}{8}$

7.(6 pts.) The solution to the initial value problem $\dfrac{dy}{dx} = \sec(x^2)$; $y(0) = 1$ is given by

(a) $y = 1 + \int_0^{x^2} \sec(t)\, dt$ (b) $y = \int^{x^2} 10\sec(t)\, dt$ (c) $y = \int_0^x \sec(t^2 + 1)\, dt$

(d) $y = 1 + \int_0^x \sec(t^2)\, dt$ (e) $y = \int_1^x \sec(t^2)\, dt$

8.(6 pts.) The position function of a particle is given by $s = t^3 - 4.5t^2 - 7t$, for $t \ge 0$. When does the particle reach a velocity of 5 ft/sec ?

(a) 7 seconds (b) 0 seconds (c) 4 seconds (d) 5 seconds (e) 2 seconds

9.(6 pts.) If $g(3) = 6$, $g'(3) = 4$, $f'(3) = 2$, $f'(6) = 7$ and $F(x) = f(g(x))$, find $F'(3)$.

(a) 24 (b) 6 (c) 28 (d) 42 (e) 14

10.(6 pts.) Let $x^2 - y^2 = 1$. Find $\dfrac{dy}{dx}$.

(a) $\dfrac{x}{y}$ (b) $\dfrac{y}{x}$ (c) $2x - 2y$ (d) $-\dfrac{y}{x}$ (e) $-\dfrac{x}{y}$

11.(6 pts.) Find the equation of the tangent line to the curve $y^2 = x^3(2 - x)$ at the point $(1, 1)$.

(a) $y = x + 1$ (b) $y = \dfrac{1}{x}$ (c) $y = -x$ (d) $y = x - 1$ (e) $y = x$

12.(6 pts.) Find the linearization $L(x)$ of $f(x) = x^3$ at the point $a = 1$.

(a) $3x - 2$ (b) $3x + 1$ (c) $2x - 3$ (d) $2x + 3$ (e) $x - 1$

13.(6 pts.) Find the maximum value of $f(x) = \dfrac{x}{x + 2}$ on the closed interval $[3, 4]$.

(a) $\dfrac{2}{3}$ (b) $\dfrac{1}{3}$ (c) $\dfrac{1}{2}$ (d) $\dfrac{3}{5}$ (e) $\dfrac{3}{4}$

14.(6 pts.) Find all numbers $c \in [-1, 1]$ that satisfy $f'(c) = \dfrac{f(1) - f(-1)}{2}$ for $f(x) = 3x^2 + 2x - 5$.

(a) -5 (b) 3 (c) 1 (d) -1 (e) 0

15.(6 pts.) What are the x–coordinates of all the inflection points of $f(x) = x^4 - 6x^2 + 100x + 99$.

(a) $x = -1$ and $x = 1$ (b) $x = -6$ (c) $x = 0$

(d) $x = 0$ and $x = -1$ (e) $x = -6$ and $x = 1$

16.(6 pts.) Find all the slant asymptotic lines of $y = f(x) = \dfrac{x^2 + x + 1}{x}$.

(a) $y = \dfrac{1}{x}$ (b) $y = x - 1$ (c) $y = x + 1$ (d) $y = -x + 1$ (e) $y = x$

17.(6 pts.) Find **all** the points on the hyperbola $y^2 - x^2 = 4$ that are closest to the point $(2, 0)$.

(a) $(1, \sqrt{5})$ (b) $(\sqrt{5}, 1)$ (c) $(1, \pm 5)$ (d) $(-1, \sqrt{5})$ (e) $(1, \pm\sqrt{5})$

18.(6 pts.) If $f(x) = \int_0^{5x} \cos(u^2)du$, find $f'(x)$.

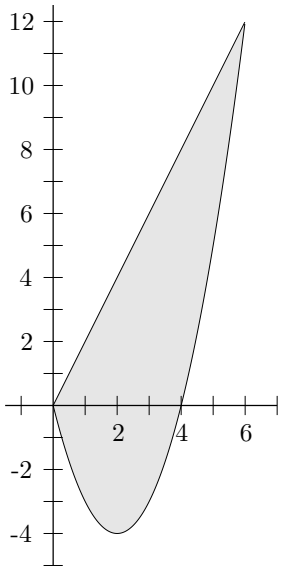
(a) $5\cos(25x^2)$ (b) $-25\cos(5x^2)$ (c) $-5\cos(5x^2)$ (d) $5\cos(5x^2)$

(e) $-5\cos(25x^2)$

19.(6 pts.) Evaluate the integral $\int_0^{\sqrt{\pi}} x\sin(x^2)dx$.

(a) $\frac{1}{4}$ (b) 2 (c) 1 (d) $1-\frac{1}{\pi}$ (e) $\frac{\pi}{4}$

20.(6 pts.) Compute the area of the region below the curve $y = 2x$ and above the curve $y = x^2 - 4x$.

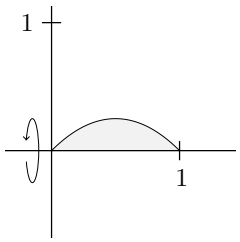


(a) $\int_0^6 \big((x^2-4x)-2x\big)\,dx$ (b) $\int_0^4 \big(2x-(x^2-4x)\big)dx+\int_4^6 \big((x^2-4x)-2x\big)dx$

(c) $\int_0^4 \big((x^2-4x)-2x\big)\,dx$ (d) $\int_0^6 \big(2x-(x^2-4x)\big)\,dx$

(e) $\int_0^4 \big(2x-(x^2-4x)\big)\,dx$

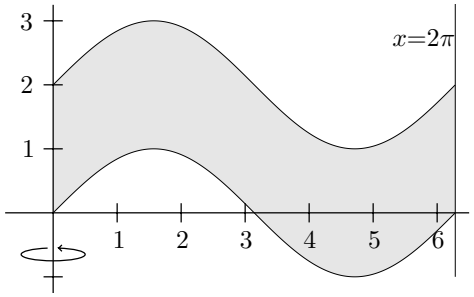
21.(6 pts.) The shape of a football can be obtained by rotating the curve $y = x - x^2$ around x-axis for $0 \le x \le 1$. Compute its volume.



(a) $\pi \int_0^1 \left(x^2 - x^4\right) dx$ (b) $2\pi \int_0^1 \left(x - x^2\right) dx$ (c) $\pi \int_0^1 \left((x-x^2)^2 - 1^2\right) dx$

(d) $\pi \int_0^1 \left(x - x^2\right)^2 dx$ (e) $2\pi \int_0^1 x\left(x - x^2\right) dx$

22.(6 pts.) The solid is obtained by rotating about the y-axis the region bounded by $y = 2 + \sin x$, $y = \sin x$, $x = 0$ and $x = 2\pi$. Find its volume.



(a) $8\pi^2$ (b) $4\pi^3$ (c) π^3 (d) $2\pi^3$ (e) $8\pi^3$

23.(6 pts.) An ice cube is melting at a rate of $3\text{cm}^3/\text{hr}$. Assume it remains a cube during the melting process. How fast is the length of a side changing when this length is 2cm?

(a) 3 cm/sec (b) $\frac{1}{4}$ cm/sec (c) 2 cm/sec (d) $\frac{3}{8}$ cm/sec (e) $\frac{8}{3}$ cm/sec

24.(6 pts.) If $f(x) = \int_0^x \sec(t)\, dt$, find $f''(x)$.

(a) $\sec(x^2)$ (b) $\sec(x)$ (c) 0 (d) $\sec(x)\tan(x)$

(e) $\cot(x)$

25.(6 pts.) Find the average value of the function $f(x) = 4x - x^2$ on the interval $[0, 3]$.

(a) 4 (b) 3 (c) 9 (d) $\frac{1}{4}$ (e) $\frac{1}{3}$

Name: ANSWERS

Instructor: ANSWERS

Final Exam
December 14, 2001

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for two hours.
- You will only hand in this page, so be sure you have marked the answer sheet below correctly. Dotted lines and new columns indicate page breaks in the test.
- Be sure that you have all 14 pages of the test.

Good Luck!

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(•)	(d)	(e)	13.	(•)	(b)	(c)	(d)	(e)
2.	(a)	(•)	(c)	(d)	(e)	14.	(a)	(b)	(c)	(d)	(•)
3.	(a)	(b)	(c)	(•)	(e)	15.	(•)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(•)	16.	(a)	(b)	(•)	(d)	(e)
5.	(a)	(•)	(c)	(d)	(e)	17.	(a)	(b)	(c)	(d)	(•)
6.	(a)	(•)	(c)	(d)	(e)	18.	(•)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(•)	(e)	19.	(a)	(b)	(•)	(d)	(e)
8.	(a)	(b)	(•)	(d)	(e)	20.	(a)	(b)	(c)	(•)	(e)
9.	(a)	(b)	(•)	(d)	(e)	21.	(a)	(b)	(c)	(•)	(e)
10.	(•)	(b)	(c)	(d)	(e)	22.	(a)	(b)	(c)	(d)	(•)
11.	(a)	(b)	(c)	(d)	(•)	23.	(a)	(•)	(c)	(d)	(e)
12.	(•)	(b)	(c)	(d)	(e)	24.	(a)	(b)	(c)	(•)	(e)
						25.	(a)	(•)	(c)	(d)	(e)

Final Exam Total: _____

Course Total: _____