MAT 1320A F2006

FINAL EXAMINATION

Max = 50

Family Name: ______________________________

Initials: ______________________________

Student Number: ______________________

•Time: 3 hours

•Basic scientific calculators are permitted: non-programmable, non-graphing, no differentiation or integration capability. Notes or books are not permitted.

•There are 18 problems. Work the problems in the space provided. Use the back-pages for rough work if necessary. Do not use any other paper. Show all work.

•Circle the correct answers for multiple choice problems. Numerical answers are rounded. Work on multiple choice problems will be examined in case of suspected fraud.

1. [2 points] A quantity of the element californium decays radioactively by half each 20 microseconds (its half-life). If the initial quantity is 2 milligrams, how much is left after 9 microseconds?

A. 0.966 B. 1.947 C. 1.013 D. 1.464 E. 1.573 F. 1.302

2. [2 points] Some values of a function are given by the following table.

x	0	0.5	1	1.5
$f(x)$	3	4	2	-1

Approximate $f'(0), f'(0.5), f'(1)$. (Use the most accurate approximation method presented in the course. Circle one letter.)

	$f'(0)$	$f'(0.5)$	$f'(1)$
A.	1	-0.5	-1
B.	2	-1	-5
C.	0.5	0	-0.5
D.	2	-1	-3
E.	-1	-1	-0.5
F.	2	-2	-1

3. [2 points] Let $f(x) = e^{3x^2+2}$. Calculate $f'(2)$.

A. e^{14} B. $12e^{14}$ C. $14e^{14}$ D. $6e^{14}$ E. $12e^{12}$ F.$6e^6$

4. [2 points] Let $f(x) = x^3 + 3x^2 - 24x + 3$. The point $(-1, 29)$ is

A. a local max	B. a local min	C. no local extremum nor inflection point
D. an inflection point	E. not on the graph	F. none of these

5. [2 points] The global maximum value of $f(x) = e^{-\sin x}$ on the interval $0 \leq x \leq 2\pi$ is

A. 0   B. e^{-1} C. 1   D. $\sqrt{2}$ E. 2   F. e

6. [2 points] Evaluate $\displaystyle\int_0^3 \frac{x}{x^2+1} dx$.

A. 1.15   B. 2.30   C. 0.92   D. 1.72   E. 3.58   F. 0.65

7. [2 points] Use the values listed in the table to estimate $\int_0^{12} f(x)dx$ by the Trapezoidal Rule.

x	0	3	6	9	12
$f(x)$	1	5	7	10	12

A. 69 B. 102 C. 85.5 D. 23 E. 34 F. 28.5

8. [2 points] Evaluate $\int_{-\pi/3}^{\pi/4} \sin^3\theta \cos\theta \, d\theta$.

A. 0 B. -0.078 C. 1 D. 1.03 E. -0.150 F. 0.061

9. [2 points] Find the average value of $f(x) = \sin(x/2)$ over the interval $0 \leq x \leq \pi/2$.

A. 0.514 B. 0 C. 0.266 D. 0.373 E. 0.476 F. 0.637

10. [2 points] Find the equation of the tangent line to $y = \arctan x$ at $x = 1$.

A. $y = 2x - 2 + \frac{\pi}{3}$ B. $y = \frac{1}{3}x - \frac{1}{3} + \frac{\pi}{4}$ C. $y = 2x - 2 - \frac{\pi}{2}$

D. $y = \frac{1}{2}x - \frac{1}{2} - \frac{\pi}{3}$ E. $y = 2x - 2 + \frac{\pi}{4}$ F. $y = \frac{1}{2}x - \frac{1}{2} + \frac{\pi}{4}$

11. [3 points] Find $\displaystyle\int \frac{x\sin(2x^2)}{\sqrt{\cos(2x^2)}}dx$. Draw a $\boxed{\text{box}}$ around the answer.

12. [3 points] Find $\displaystyle\int x^2\cos(3x)\,dx$. Draw a $\boxed{\text{box}}$ around the answer.

13. [3 points] Find the derivatives of the following functions. Draw a $\boxed{\text{box}}$ around each answer.

(a) $f(t) = t^2 e^{3t} + \ln(2 + t^2)$

(b) $g(x) = \cos(x^2 + x) - 2^x$

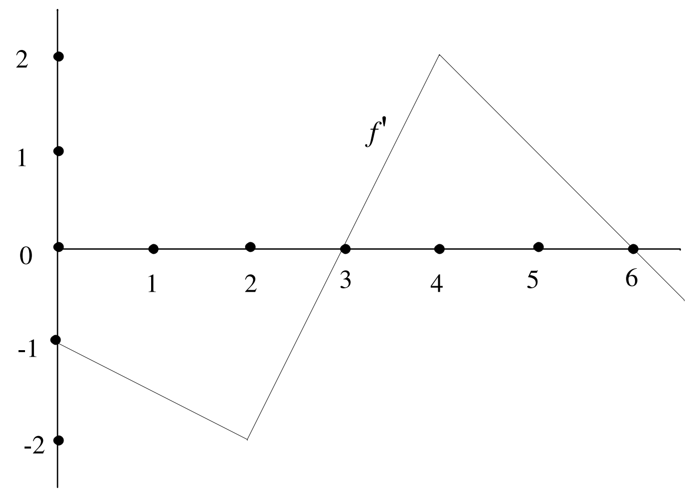
(c) $h(z) = \dfrac{z^2 + 1}{e^z + 1}$

14. [3 points] Find $\displaystyle\int \frac{\ln x}{x} dx$. Draw a $\boxed{\text{box}}$ around the answer.

15. [3 points] Find $\displaystyle\int \frac{dx}{x^2\sqrt{1-x^2}}$. Draw a $\boxed{\text{box}}$ around the answer.

16. [3 points] Find $\displaystyle\int \frac{1}{x^2+4x+3}dx$. Draw a $\boxed{\text{box}}$ around the answer.

17. [6 points] The following figure shows the graph of the derivative f' of a function f with the value $f(0) = 2$.



(a) Fill in the following table of values of f.

x	0	2	3	4	6
$f(x)$	2				

(b) Find all critical points and inflection points of f and their coordinates (x, y).

(c) Sketch the graph of f *on the same axes* as the graph of f' in the figure. Label the points found in (b) on this graph by their coordinates.

Critical points (x, y) :

Inflection points (x, y) :

18. [6 points] Let $f(x) = x^4 - 4x^3 - 8x^2 + 1$ for $-5 \leq x \leq 5$.

(a)Find the critical points and the intervals where f is increasing or decreasing. Classify the critical points as local maxima, local minima, or neither.

Answer.

Critical points at $x =$

Increasing: Decreasing:

Local maxima at $x =$ Local minima at $x =$

(b)Find the global maximum and the global minimum of f.

Answer.

Global maximum at $x =$ and $f(x) =$

Global minimum at $x =$ and $f(x) =$