

ANSWER SHEET

MATH 121 - FINAL EXAM

PRINT NAME: _____
Last, First name

Thursday, May 5, 2005 – 8:00 AM – 12:00 NOON

1. Do NOT SEPARATE answer sheet from rest of test.
2. Work and CIRCLE the answer to each problem INSIDE this test.
3. Circle your answer a SECOND TIME on this page.
4. Blank answers are considered INCORRECT.
5. Do all 25 problems.

6. Turn in ENTIRE TEST.

SCORE: _____

QUESTION	ANSWER	QUESTION	ANSWER
1.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	13.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
2.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	14.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
3.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	15.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
4.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	16.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
5.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	17.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
6.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	18.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
7.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	19.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
8.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	20.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
9.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	21.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
10.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	22.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
11.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	23.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
12.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e	24.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e
		25.	<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e

Thursday, May 5, 2005 – 8:00 AM - 12:00 NOON

PRINT NAME: _____
Last, First

Section #: _____ Social Security Number: _____

4 pts (1.) If $f(f(x)) = \frac{x^4 + 2x^2 + 1}{x^4 + 2x^2 + 2}$, then $f(x) =$

- $\frac{(x+1)^2}{(x^2+1)^2}$
 $\frac{1}{x^2+1}$
 $\left(\frac{x}{x^2+1}\right)^2$
 $\frac{x^2}{(x^2+1)^2}$
 None of the above

4 pts (2.) $\lim_{x \rightarrow 0} \sin\left(\frac{1}{\sin x}\right) =$

- 0
 -1
 1
 Does not exist
 None of the above

4 pts (3.) If a is a positive number, then $\lim_{x \rightarrow 0} \frac{\sqrt{a+x} - \sqrt{a-x}}{x} =$

- \sqrt{a}
 $\frac{1}{\sqrt{a}}$
 $\sqrt{1+a}$
 Does not always exist
 None of the above

4 pts (4.) The number of points where the function

$$f(x) = (\sin x) \left(\left| x - \frac{\pi}{2} \right| + |x - \pi| \right) + (\cos x) \left(|x| - \left| x - \frac{\pi}{2} \right| \right)$$

is **not** continuous is:

- 0
 1
 2
 3
 None of the above

4 pts (5.) If f is a differentiable function and $g(x) = f(e^x)$, which of the following limits does not represent the derivative $g'(x)$?

- a $\lim_{h \rightarrow 0} \frac{f(e^x e^h) - f(e^x)}{h}$
 b $e^x \lim_{h \rightarrow 0} \frac{f(e^x + h) - f(e^x)}{h}$
 c $\lim_{h \rightarrow 0} \frac{f(e^x) - f(e^x e^{-h})}{h}$
 d $e^x \lim_{h \rightarrow 0} \frac{f(e^{x+h}) - f(e^x)}{h}$
 e None of the above

4 pts (6.) If $f(x) = e^x \sin x$ and $g(x) = e^x \cos x$, then $f'(x) + g'(x) =$

- a $f(x) - g(x)$
 b $g(x) - f(x)$
 c $2g(x)$
 d $2f(x)$
 e None of the above

4 pts (7.) If $f(x) = \frac{\arctan x}{1 + x^2}$, then $\frac{1}{(1 + x^2)^2} - f'(x) =$

- a $\frac{2x \arctan x}{(1 + x^2)^2}$
 b $\frac{x}{(1 + x^2)^2}$
 c $\frac{\arctan x}{(1 + x^2)^2}$
 d $\frac{\arctan x}{1 + x^2}$
 e None of the above

4 pts (8.) If $f(x) = \cos(\arcsin x)$, then $f'(x) =$

- a $\frac{\arcsin x}{\sqrt{1 - x^2}}$
 b $\frac{\arccos x}{\sqrt{1 - x^2}}$
 c $\frac{-x}{\sqrt{1 - x^2}}$
 d $\frac{2x}{\sqrt{1 - x^2}}$
 e None of the above

4 pts (9.) If $f'(x) = \frac{1}{x^2 + 2}$ and $g(x) = f(3x - 1)$, then $g'(x) =$

- a** $\frac{1}{3x^2 + 2x + 1}$
 b $\frac{1}{x^2 + 6x + 1}$
 c $\frac{1}{9x^2 + 3x + 1}$
 d $\frac{1}{x^2 + 3x - 1}$
 e None of the above

4 pts (10.) Which of the following curves intersects the curve $xy = 1$ perpendicularly?

- a** $x = y^2$
 b $y = x^2$
 c $x^2 - y^2 = 1$
 d $x^2 + y^2 = 2$
 e None of the above

4 pts (11.) The number of points where the curve $x^2 - xy + \frac{3}{4}y^2 = 7$ has a horizontal tangent line is:

- a** 0
 b 1
 c 2
 d 3
 e None of the above

4 pts (12.) The number of inflection points of the function $f(x) = \begin{cases} x \ln|x| & , x \neq 0 \\ 0 & , x = 0 \end{cases}$ is

- a** 0
 b 1
 c 2
 d 3
 e None of the above

4 pts (13.) Which of the following functions does not have a horizontal asymptote?

a $f(x) = \arctan(e^x)$ **b** $f(x) = \frac{1 - e^{-x^2}}{1 + e^{-x^2}}$ **c** $f(x) = \frac{\sin^2 x}{1 + \sin^2 x}$

d $f(x) = \frac{x}{\ln(1 + e^x)}$ **e** None of the above

4 pts (14.) Which of the following equations represents the curve parametrized by the equations

$$x(t) = \frac{3t}{1+t^3}, \quad y(t) = \frac{3t^2}{1+t^3} \quad (t \neq -1) ?$$

a $x^2 + y^2 = 3xy$ **b** $x^3 + y^3 = 3xy$ **c** $x^{1/3} + y^{1/3} = 3xy$

d $(x^2 + y^2)^2 = 3x^2y^2$ **e** None of the above

4 pts (15.) An object moving on the x -axis has position $x(t) = t^2 - 2t + 5$. What is the total distance travelled by the object during the first 2 seconds?

a 0 **b** 1 **c** 2

d 3 **e** None of the above

4 pts (16.) Which is the smallest number in the range of the function $f(x) = x^{2/3}(5 - 2x)$, $-1 \leq x \leq 2$?

a -1 **b** 0 **c** 3

d 7 **e** None of the above

4 pts (17.) If Newton's method is used to approximate the root of the equation $x^3 - 3x + 6 = 0$, for which starting value x_0 does the iteration fail to work?

- a $-\sqrt[3]{6}$ b 0 c 1
 d $\sqrt[3]{6}$ e None of the above

4 pts (18.) A worker stands $4m$ from a hoist being raised at the rate of $2m/s$. How fast (in rad/s) is the angle of sight θ changing at the instant the hoist is $1.5m$ above eye level?

- a 0.44 b 0.49 c 0.54
 d 0.59 e None of the above

4 pts (19.) A painting is hung on a wall in such a way that its upper and lower edges are $10ft$ and $7ft$ above the floor, respectively. An observer whose eyes are $5ft$ above the floor stands x feet from the wall. How far away from the wall should the observer stand to maximize the angle subtended by the painting?

- a 3 b 4 c $\sqrt{10}$
 d $\sqrt{11}$ e None of the above

4 pts (20.) If $\lim_{x \rightarrow 0} \frac{e^x - 1 - x - ax^2}{x^3}$ exists, then $a =$

- a $\frac{e}{5}$ b $\frac{e^2}{15}$ c $\frac{1}{2}$
 d $\frac{2}{5}$ e None of the above

4 pts (21.) If $F(x) = \int_1^{\sqrt{\ln x}} e^{t^2} dt$ for $x > 1$, then $F'(x) =$

- a** $\sqrt{\ln x} e^{x^2}$
 b $\frac{1}{2x\sqrt{\ln x}} e^{x^2}$
 c $\frac{1}{2x\sqrt{\ln x}}$
 d $\frac{1}{2\sqrt{\ln x}}$
 e None of the above

4 pts (22.) If $\int_0^b \frac{x}{\sqrt{x^2+5}} dx = 5$, then $b =$

- a** 1
 b 2
 c 3
 d 4
 e None of the above

4 pts (23.) If $\int_a^2 \frac{x^3}{x^2-1} dx = 1 + \frac{1}{2} \ln 3$, then $a =$

- a** $\sqrt{3}$
 b $\frac{3}{2}$
 c $\frac{e}{2}$
 d $\sqrt{2}$
 e None of the above

4 pts (24.) The area of the region bounded by the line $y = 3x$ and the curve $y = x^3 + 2x^2$ is

- a** 11
 b $\frac{71}{6}$
 c 12
 d $\frac{85}{7}$
 e None of the above

4 pts (25.) A particular radioactive substance has a half-life of 600 years. About how much of a 50g sample will remain after 125 years?

- a** 29g
 b 33g
 c 37g
 d 43g
 e None of the above