MAC 2233 TEST 4 A

FALL 2007

A. Sign your scantron sheet in the white area on the back in ink.

B. Write and code in the spaces indicated:

1) Name (last name, first initial, middle initial)
2) UF ID number
3) Discussion section number

C. Under "special codes", code in the test ID number 4, 1.

1 2 3 • 5 6 7 8 9 0

• 2 3 4 5 6 7 8 9 0

D. At the top right of your answer sheet, for "Test Form Code" encode A .

• B C D E

E. This test consists of five two-point and nine five-point multiple choice questions, one five-point bonus question, and two pages (both sides) of partial credit questions worth 25 points.

The time allowed is 90 minutes.

F. WHEN YOU ARE FINISHED:

1) Before turning in your test check for transcribing errors. Any mistakes you leave in are there to stay.

2) You must turn in the tear off sheets and your scantron to your discussion leader. Be prepared to show your picture I.D. with a legible signature.

3) The answers will be posted on the MAC2233 homepage after the exam.

Problems 1 - 5: 2 points each

The following applies to problems 1 - 3.

The training department of a company has determined that an employee who has completed a basic training course can assemble $Q(t) = 50 - 30e^{-0.5t}$ computer components per day t months after starting to work on an assembly line.

1. A newly trained employee is just starting to work on an assembly line. How many units can she be expected to put together in a day?

a. 50 units b. 30 units c. 0 units d. 20 units

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2. At what rate is the employee's ability to assemble the components (measured in units per day) changing after 10 months on the assembly line?

a. increasing by $\frac{15}{e^5}$ per month

b. decreasing by $\frac{30}{e^5}$ per month

c. increasing by $\frac{20}{e^4}$ per month

d. increasing by $\frac{60}{e^5}$ per month

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3. Over time, what is the largest number of components an experienced employee can be expected to assemble in a day?

a. 20 b. 80 c. 50 d. There is no such number.

4. $\int \frac{e^{6x}}{4}\,dx =$ _____ $e^{6x} + C.$

a. $\frac{1}{4}$ b. $\frac{1}{24}$ c. $\frac{3}{2}$ d. 24 e. $\frac{2}{3}$

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5. If $\int f(x)\,dx = \ln(1+\ln x) + C$, then $f(x) =$_____.

a. $\frac{1}{1+\ln x}$ b. $1+\ln x$ c. $\frac{1}{x(1+\ln x)}$ d. $\frac{[\ln(1+\ln x)]^2}{2x}$

Problems 6 - 15: 5 points each

6. Use logarithmic differentiation to find $f'(2)$ for $f(x) = x^x$.

a. 2 b. $4+4\ln 2$ c. $1+\ln 2$ d. 4 e. $4+2\ln 2$

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7. The expiration date of a dairy product is determined by the amount of a certain bacteria that grows naturally in the product. The bacteria count when the product is first packaged is 40 million and reaches 100 million after 6 days. If the product cannot be sold after the bacteria count reaches 320 million, find the number of days the product can be on grocery store shelves. Assume the bacteria are growing exponentially.

a. $\frac{6\ln 2.5}{\ln 8}$ days b. $\frac{\ln 8}{6\ln 2.5}$ days c. $\frac{6\ln 2.5}{\ln 3.2}$ days

d. $3\ln 3.2$ days e. $\frac{6\ln 8}{\ln 2.5}$ days

8. $\int \frac{x^{\frac{7}{3}} - 1}{x^2}\, dx =$_____

a. $\frac{3}{5}x^{\frac{5}{3}} - \frac{1}{x} + C$ b. $\frac{3}{4}x^{\frac{4}{3}} + \frac{1}{x} + C$ c. $x^{\frac{1}{3}} - \frac{1}{x^2} + C$

d. $\frac{3}{4}x^{\frac{4}{3}} - \ln|x| + C$ e. $\frac{x^{\frac{10}{3}} - 10x}{x^3} + C$

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9. $\int \frac{2e^x - x}{4e^x - x^2}\, dx =$_____.

a. $\frac{-2}{(4e^x - x^2)^2} + C$ b. $\ln|4e^x - x^2| + C$ c. $\frac{4e^x - x^2}{12e^x - x^3} + C$

d. $2\ln|4e^x - x^2| + C$ e. $\frac{\ln|4e^x - x^2|}{2} + C$

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10. The marginal cost of producing x thousand units of a new product is given by $C'(x) = 0.3x^2 + 4x - 2$. If the cost of producing ten thousand units is \$4200, find the fixed costs of production.

a. \$4480 b. \$3920 c. \$4500 d. \$4200 e. \$3900

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11. Find the area of under the curve $f(x) = \frac{(\ln x)^3}{x}$ on the interval $[1, e^2]$.

a. 16 b. 2 c. $\frac{16}{e^4}$ d. 4 e. $\frac{15}{4}$

12. Evaluate $\int x\sqrt{x+2}\,dx$.

a. $\frac{2x^2}{3}(x+2)^{\frac{3}{2}}+C$ b. $\frac{2}{5}(x+2)^{\frac{5}{2}}-\frac{4}{3}(x+2)^{\frac{3}{2}}+C$ c. $\frac{2}{3}(x+2)^{\frac{3}{2}}+C$

d. $(x+2)^{\frac{3}{2}}-2\sqrt{x+2}+C$ e. $\frac{2}{5}(x+2)^{\frac{5}{2}}-4(x+2)^{\frac{3}{2}}+C$

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13. Find the average value of $f(x)=\dfrac{e^{\sqrt{x+1}}}{\sqrt{x+1}}$ on $[0,3]$.

a. $\frac{e^2-e}{6}$ b. $2(e^2-e)$ c. $\frac{e^2-e}{3}$ d. $\frac{e^2-e}{2}$ e. $\frac{2(e^2-e)}{3}$

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14. Approximate the value of $\int_1^4 \frac{2}{x}\,dx$ by finding a Riemann Sum with three subintervals of equal length, using the midpoints of each interval as the representative points.

a. $\frac{4}{3}+\frac{4}{5}+\frac{4}{7}$ b. $2\ln 4$ c. $\frac{2}{3}+\frac{2}{5}+\frac{2}{7}$

d. $1+\frac{5}{3}+\frac{7}{3}$ e. $\frac{1}{3}+\frac{1}{5}+\frac{1}{7}$

BONUS!! 15. Find the area of the region enclosed by $y=4x-x^2$ and $y=x$. Hint: Sketch the region.

a. $\frac{13}{2}$ b. $\frac{11}{2}$ c. $\frac{9}{2}$ d. $\frac{7}{2}$ e. $\frac{5}{2}$

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Sect#_____ Name_____

UF ID_____ Signature_____

SHOW ALL WORK TO RECEIVE FULL CREDIT!!

1. a) Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = \frac{e^x(x^2+1)^2}{\sqrt{2x+4}}$.

$\frac{dy}{dx} =$ _____

b) Use part (a) to find the slope of the tangent line to $y = \frac{e^x(x^2+1)^2}{\sqrt{2x+4}}$ at $x = 0$.

$m =$_____

2. Let $f(x) = \dfrac{3 - \ln x}{x}$.

a) Find $f'(x)$.

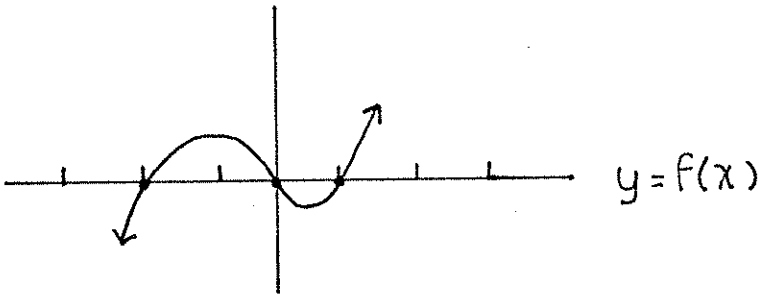
$f'(x) =$_____

b) Find the relative extrema of $f(x)$. If none, write "none".

relative maximum at $x =$_____ Maximum value:_____

relative minimum at $x =$_____ Minimum value:_____

3. Complete the following for the graph below.



Assume that $\int_{-2}^{0} f(x)dx = 2$ and $\int_{0}^{1} f(x)dx = -\dfrac{1}{2}$.

1) $\int_{1}^{0} f(x)dx =$_____ 2) $\int_{-2}^{1} f(x)dx =$_____

3) The area of the region bounded by $y = f(x)$ and the $x-$axis on $[-2, 1]$

is _____ square units.

Name_____ Section Number_____

4. The rate at which the demand, x, for a certain product is changing with respect to price p is given by

$$\frac{dx}{dp} = \frac{-4000p}{(p^2-9)^{\frac{3}{2}}}.$$

Find the demand function $x = f(p)$ if the demand is 6400 units when the price is \$5.

$x =$_____

5. State whether each of the following is true or false. Assume that $g(x)$ and $g'(x)$ are continuous functions.

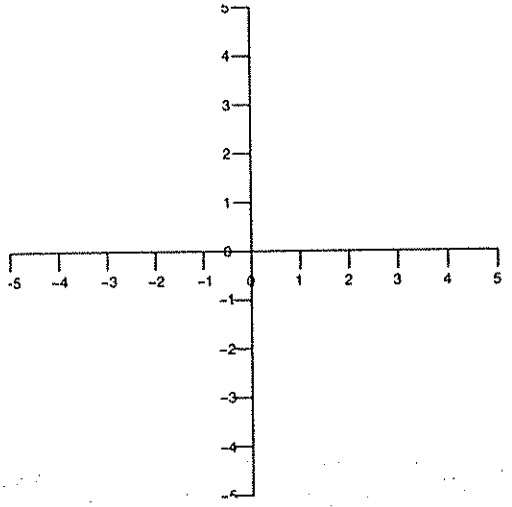
_____ a) $\int_a^b g'(x)dx = g(b) - g(a)$.

_____ b) $\frac{d}{dx}\left[\int_a^b g(x)dx\right] = 0$.

_____ c) $\int xg(x)dx = x\int g(x)dx$.

5. Let $f(x) = \begin{cases} 1 - x^2 & x \leq 0 \\ e^{-x} & x > 0 \end{cases}$.

a) Sketch the graph of $y = f(x)$ and the region bounded by $f(x)$, the $x-$axis, and the line $x = 2$.



b) Find the area of the region.

Area = _____ units