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Mathematics 108, Review 1
Spring Semester 1998

1. Find a function $y = y(x)$ such that: $y' = e^{-2x} - 4x^3 + 1$, and $y(0) = 12$. **2.** Compute the indefinite integral $\int te^{-.25t}dt$. **3.** Calculate the integral $\int_0^1 xe^{x/3}dx$. **4.** Compute the area of the region enclosed by the curves $y = 7 - x^2$ and $y = -1 + x^2$. **5.** Find the function whose graph has tangent of slope $x + lnx$ for each positive value of x, and passes through the point $(1, 8)$.

6. The marginal cost function for producing x units of a certain product is given by the function $MC(x) = \frac{1}{4}x + 5,000$. If the cost for producing 20 units is $50,000 then determine the cost function $C(x)$. Recall, marginal cost is by definition the derivative of the cost function. **7.** The marginal profit function for a company producing and selling a certain product is $MP(x) = -0.6x + 3,000$. If 40 units are produced and sold then the company's profit is $25,000. Determine the profit function $P(x)$. Find the sales amount x which maximizes the profit. Explain in economic terms the meaning of the negative coefficient of x in $MP(x)$. **8.** If $y = y(x)$ is the solution to the initial value problem: $y' + \frac{1}{x} = x^5$, $y(1) = 3$, then find $y(e)$. **9.** Let $f(x), 2 \leq x \leq 4$, be a continuous function with $f(2) = 10$, $f(2.5) = 14$, $f(3) = 12$, and $f(3.5) = 8$. By computing the Riemann sum with 4 subintervals, and using the value of the function at the left endpoints, one finds that $\int_2^4 f(x)dx$ is approximately equal to: A. 44 B. -22 C. 22 D. 21 E. 4 **10.** The area between the curves $y = 2x^2 - 4x + 6$ and $y = -x^2 - 2x + 1$ from $x = 1$ to $x = 2$ is A. 1 B. 14 C. 5 D. 4 E. 9 **11.** The area of the region between the curve $y = x^5$ and the x-axis, from $x = -1$ to $x = 1$, is equal to: A. 0 B. 1/6 C. 1/3 D. -1/6 E. 1/5 **12.** $\int x^7 e^{x^8}$ is equal to: A. $\frac{1}{7}e^{x^7} + c$ B. $\frac{e^{x^8}}{x^8} + c$ C. $\frac{1}{8}e^{x^8}$ D. $\ln x^8 + c$ E. $\frac{1}{8}e^{x^8} + c$ **13.** Which of the followings is an antiderivative of $\dfrac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}}$? A. $\frac{e^{3x}+e^{-3x}}{e^{3x}-e^{-3x}}$ B. $\ln(e^{3x} + e^{-3x})$ C. $(e^{3x} - e^{-3x})^{-1}$ D. $\frac{1}{3}\ln(e^{3x} + e^{-3x})$ E. $(e^x + e^{-x})^{-\frac{3}{2}}$

14. $\int x^5 \ln x dx$ is equal to: A. $(\frac{1}{6}\ln x - \frac{1}{36})x^6 + c$ B. $(\frac{1}{6}\ln x + \frac{1}{36})x^6 + c$ C. $x^5e^x + c$

D. $\ln x + c$ E. $(\frac{1}{6}\ln x - \frac{1}{36})x^6$. **15.** Estimate the integral $\int_1^3 f(x)dx$ by using a uniform partition of 4 subintervals and by evaluating the function at the RightSide of each subinterval, when the following values of the function are given

x	1.5	2	2.5	3
$f(x)$	0.5	-1	-2	-1.5

16. Suppose $F(x)$ is an antiderivative of a continuous function $f(x)$. If $F(2) = 8$ and

$F(4) = -2$ then compute $\int_2^4 f(x)dx$. **17.** Estimate the area of the region between the two curves and the p-axis shown below.

18. In the above picture the curves are given by $D(q) = 20e^{-0.002q}$ and by $S(q) = 0.02q + 1$. Compute the area of the region between the two curves and the p-axis. **19.** Write the Riemann sum for the function $f(x) = \frac{1}{x^3}$ over the interval $[0, 1]$ if the interval is partitioned into 10 equal segments and the right-hand endpoint is used as the point x_j in the j-th interval. Do not compute it. **20.** Suppose $A(t)$ is the area under the graph of $y = \frac{1}{3+x^4}$ from 0 to t, for any positive number t. Compute is $F'(t)$.

Mathematics 108, Exam 1, Spring 1997

1. (Partial Credit) **a.** The marginal profit of a company producing and selling a certain product is given by $MP(x) = -0.2x + 50$, where x is the number of units sold per day. When 100 units are produced and sold, the company's profit is \$1,500. Find the profit function $P(x)$. **b.** Find the sales amount x which maximizes the profit. **2.** (Partial Credit) (Not done yet) **a.** An

Individual Retirement Account (IRA) is opened with an initial investment of \$1,000. Then \$2,000 per year is deposited uniformly and continuously throughout the year. Assume the interest rate is 10% compounded continuously. Find the initial condition, and the differential equation for the amount of money, $M(t)$, in the IRA at any time t. **DO NOT SOLVE the differential equation**. | Differential Equation: . |, | Initial Condition: . |

b. Solve the initial value problem: $y + y' = x^2e^{-x}$, $y(0) = 1$ **3.** (Partial Credit) ((a) Not

done yet) **a.** The demand and supply curves for a product are as shown in the following picture. Shade the region whose area represents the Consumer Surplus. Then give your best estimate for the Consumer Surplus.

b. Compute the area of the region enclosed by the curves $y = x^2$ and $y = x + 2$. Draw the region first, and beware that the **area is a positive number!** **4.** (No Partial Credit) Compute the following integrals. Show your

work. **a.** $\displaystyle\int xe^{0.5x}dx$ **b.** $\displaystyle\int_0^{-1+e} \frac{1}{1+t}dt$ **c.** $\displaystyle\int (x+1)\left(2x^2+4x\right)^{99} dx$ **5.** (No

Partial Credit) ((b) and (c) Not done yet) **a.** A continuous function $f(x)$ defined on the interval $[1,6]$ is known to have the following values:

x	3/2	5/2	7/2	9/2	11/2
$f(x)$	0.2	0.7	0.1	-0.3	-0.3

If the interval $[1,6]$ is subdivided into 5 equal subintervals find the value of the Riemann sum of f arising from the above data. Show your work. **b.** An apartment in Manhattan produces a perpetual income stream flowing continuously and uniformly at a rate of \$50,000 per year. This income is continuously and uniformly invested at a rate of 5%. Find the present value of this stream. Show your work. **c.** A certain sum of money is invested at an interest rate of 14% compounded continuously. How many years will it take for the capital to double? (You may take $\ln 2 = 0.7$).

EXAM 1 IS ON FEBRUARY 3, TUESDAY, 8:00-9:15 AM
Section 02 in NIEW 127

REVIEW SESSIONS: Open to all Math 108 Students • Sunday, February 1, from 2:30 to 3:30pm in Cushing 117, by Prof. Alex. Himonas. • Monday, February 2, from 7:00 to 8:00pm in DBRT 102, by Alan Howard.

Format: The Math 108, Exam 1, Spring 1996, will be done by the Teachers in all sections on Monday's class. Therefore the Review sessions will not cover the old Exam 1 but rather only answer questions and problems asked by the students. The Teachers of Math 108 **STRONGLY** recommend that the Students do/try as many of the review problems as they can before attending the REVIEW SESSIONS.