MATH 1120 Final Examination Fall 2000

Name : _____

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1. Find the following derivatives :

   (a) $\frac{d}{dx}(5x^2 + 4x^{-3}) =$

   (b) $\frac{d}{dx}(x^{\frac{2}{3}} - \frac{1}{\sqrt{x}}) =$

   (c) $\frac{d}{dx}(5e^x + 6\ln x) =$

   (d) $\frac{d}{dx}(x^7 e^x) =$

   (e) $\frac{d}{dx}(\frac{x^2}{x^2+4}) =$

   (f) $\frac{d}{dx}(3x^2 + 1)^{1/4} =$

(g) $\frac{d}{dx}(x^3(e^x+5)^6) =$

(h) $\frac{d}{dx}(e^{2x}\ln^3 x) =$

(i) $\frac{d}{dx}\sqrt{\frac{e^x}{e^x+1}} =$

2. Find the following integrals:

(a) $\int(6x^5+4x-1)dx =$

(b) $\int(e^x+\frac{2}{x})dx =$

(c) $\int(x^{1/3}-x^{-2})dx =$

(d) $\int x^2(x^3+5)^{21}dx =$

(e) $\int \frac{\ln^3 x}{x}dx =$

(f) $\int \frac{x^2}{x^3+1}dx =$

(g) $\int_0^4 (3x^2+2)dx =$

(h) $\int_0^1 xe^{x^2}dx =$

(i) $\int_0^3 \frac{1}{\sqrt{5x+1}}dx =$

3. (a) Find an equation of the tangent line to the graph of $y = 3x^2 + 6$ at the point (1,9).

(b) Find the intervals(s) where $f(x) = x^3 - 3x + 1$ is increasing and the interval(s) on which it is decreasing.

(c) Find all the inflection points of the function $f(x) = \frac{1}{12}x^4 - \frac{1}{3}x^3$.

(d) A man wishes to have a 600 square-foot rectangular-shaped garden in his backyard. One side will be formed by the external wall of his house, two sides will be constructed of pine boards, and the fourth side will be made of galvanized steel fencing material. If the pine board fencing costs \$9 per running foot and the steel fencing costs \$3 per running foot, determine the dimensions of the enclosure that can be erected at minimum cost.

(e) By cutting away identical squares from each corner of a rectangular piece of cardboard and folding up the resulting flaps, an open box may be made. If the cardboard is 16 in. long and 10 in. wide, find the dimensions of the box that will yield the maximum volume.

4. (a) Find the area of the region under the graph of the function $f(x) = 4x^3 + 2x$ on the interval $[0, 1]$.

(b) A man is expected to have an imcome stream at the rate $R(t) = 100000$ dollars per year in the next 5 years. What is the present value of the income stream if the interest rate is 8% per year compounded continuously ?

(c) The manager of a cable television service estimates that the total number of subscribers to the service in a certain city t years from now will be $N(t) = 80000\sqrt{1 + 2t}$. Find the average number of cable television subcribers over the next 4 years if this prediction holds true.