MATH 1120 Final Examination Summer 2002

Name : _____

SHOW YOUR WORK FOR CREDITS. ID : _____

1. Find the following derivatives :

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

   (b) $\frac{d}{dx}(\frac{2}{\sqrt{x}} - x^{\frac{5}{4}} + 5\ln x) =$

   (c) $\frac{d}{dx}(5x^2 + 1)^6 =$

   (d) $\frac{d}{dx}(x^9(2x + 1)^8) =$

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

   (f) $\frac{d}{dx}(x^3e^{5x}) =$

(g) $\frac{d}{dx}(e^{2x}\ln(3x+1)) =$

(h) $\frac{d}{dx}\sqrt{\frac{x}{\ln x}} =$

2. Find the following integrals:

(a) $\int(15x^4+2x-1)dx$

(b) $\int(x^{2/3}+\frac{1}{x})dx$

(c) $\int xe^{x^2}dx$

(d) $\int x^2(x^3+1)^8 dx$

(e) $\int \frac{x}{\sqrt{x^2+1}} dx$

(f) $\int_1^2 (6x+3) dx$

(g) $\int_0^3 e^{2x} dx$

(h) $\int_1^e \frac{\ln x}{x} dx$

3. (a) Find the intervals(s) where $f(x) = x^3 - 12x + 1$ is increasing and the interval(s) on which it is decreasing.

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

(c) Find the absolute maximum and the absolute minimum of

$$f(x) = 5 - (x - 4)^{2/3}$$

on the interval $[3, 12]$.

(d) 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 24 in. long and 15 in. wide, find the dimensions of the box that will yield the maximum volume.

(e) If an open box has a square base and a volume of 500 in.^{3}, and is constructed from a tin sheet, find the dimensions of the box, assuming a minimum amount of material is used in its construction.

4. (a) 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 9% per year compounded continuously ?

(b) 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 $N(t) = 50000\sqrt{1+3t}$. Find the average number of cable television subcribers over the next 5 years if this prediction holds true.

(c) Find the the area of the region completely enclosed by the graphs of the given functios $f = 2x + 4$ and $g = x^2 - 4$.