Mathematics SM122S - 2021 - Test #1 - 18 September 2008

Part 1 - No calculator.

1. (39 points) Evaluate the following integrals by hand and show all work. You may check your answers on your calculator.

   (a) $\int x^2 \ln(3x)\, dx$

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

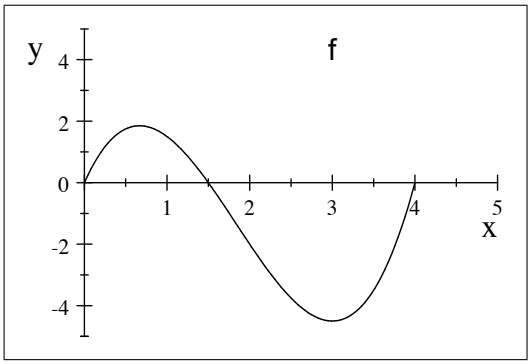
   (c) $\int \frac{x+2}{x^2-x-2}\, dx$

2. (10 points) Evaluate $\int_0^{\frac{1}{2}} \frac{1}{\sqrt{1-x^2}} dx$

3. (13 points) Does $\int_0^{\infty} \frac{x}{(x^2+1)^3} dx$ converges or diverge? If it converges, what value does it converge to?

Part 2 - You may use your calculator.

4. (20 points) Let f be the continuous function graphed below and let $g(x) = \int_0^x f(t)\,dt$ for $0 \le x \le 4$.



(a) Is $g(4)$ positive, negative or zero?

(b) Where does g attain its maximum?

(c) On what interval(s) is g concave upward?

(d) Let $h(x) = \int_0^{3x} f(t)\,dt$, where f is the same function as before. Find $h'(1)$.

5. (18 points) Consider the definite integral $\int_0^2 \sqrt{x^4+1}dx$.

(a) First, use your calculator to approximate this integral by $R_{100.}$ Give 5 decimal places.

(b) Next, use Simpson's rule with $n = 4$. Give 5 decimal places.

(c) Do the integral using your calculator, being sure to ask for the approximation. Which answer was closer, a or b?

Extra Credit (10 points - Not much partial credit will be given.) Evaluate $\int (xe^x + e^x)\sqrt{1-(xe^x)^2}\,dx$.