- Please put your name, ID number, and section number (or time) on your blue book.
- The exam is CLOSED BOOK, but you may use a page of notes.
- Calculators are NOT allowed.
- You need not simplify answers. For example, if $3\ln 2 - \ln 6$ is your answer, you need not simplify it to $\ln(4/3)$.
- **You must show your work to receive credit.**

1. (80 pts.) Evaluate the following integrals. Remember to show your work!

   (a) $\displaystyle \int (\sin x)\,(\cos(\cos x))\, dx$

   (b) $\displaystyle \int \frac{t^2}{\sqrt{1-t^2}}\, dt$

   (c) $\displaystyle \int \sin(t^{1/2})\, dt$

   (d) $\displaystyle \int \frac{1+e^x}{1-e^x}\, dx$

2. (20 pts.) Let $f(x) = e^{-x^2/2}$ and let $I = \int_0^1 f(x)\, dx$.

   It can be shown that $f'(x) < 0$ for $x > 0$ and $f''(x) < 0$ for $|x| \le 1$.

   The left, right, Trapezoidal, and Midpoint Rules were used to estimate I and the same number of subintervals were used in each case. Call the estimates L, R, T, and M, respectively. Order I, L, M, R, and T from smallest to largest.

   You MUST explain how you obtained your ordering. Simple pictures with some clear words relating to them will suffice.

3. (25 pts.) Determine which of the following integrals are divergent and which are not. Evaluate all integrals which are NOT divergent.

   (a) $\displaystyle \int_0^1 \frac{2x}{x^2-4x+3}\, dx$ (b) $\displaystyle \int_2^4 \frac{2x}{x^2-4x+3}\, dx$ (c) $\displaystyle \int_4^6 \frac{2x}{x^2-4x+3}\, dx$

   Note that $x^2 - 4x + 3 = (x-1)(x-3)$.

END OF EXAM