Name

- This test is closed notes, closed book.
- Laptops and calculators are NOT allowed.
- There are 8 pages and 5 questions total.
- You can leave an answer as a numerical expression without computing the final value. For example, this is a perfectly acceptable answer:
  \[ \frac{(250 - 63)}{(1 - e^{(-6*3.5)})} \times \ln\left(\frac{27}{168}\right) \]  
  Show your work clearly!!
- The maximum score in the test is 80 points.

Signature

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1. Compute the following integrals (note that some of them are indefinite integrals and some are definite integrals).

(a) (3 pts) \( \int (2x + 5)e^{(x^2+5x-1)}\,dx \).

(b) (4 pts) \( \int_0^1 x(1 - x)^{10}\,dx \).

(c) (4 pts) \( \int sec^5(x)tan(x)\,dx \).

(d) (4 pts) \( \int \frac{x^4-3}{x^2-1}\,dx \).
(e) (6 pts) \(\int \ln(x)\,dx\).

(f) (6 pts) \(\int x^2 \sin(x)\,dx\).

(g) (6 pts) \(\int \sec^4(x)\,dx\). (Hint: \(1 + \tan^2(x) = \sec^2(x)\))

(h) (2 pts) Suppose \(\int_{0}^{1} \sin(x^2)\,dx = C\). What is \(\int_{-1}^{0} \sin(x^2)\,dx\) in terms of \(C\)?
(i) (5 pts) \( \int e^{2x} \sqrt{1 + e^x} \, dx \).

2. (15 pts) Find the area of the region bounded by the graphs of \( y = |x| \) and \( y = x^2 \).
3. **(10 pts)** Consider the region bounded by the curves $y = x^3 - 3x^2 + 3x$ and $y = x^2$. Set up (but DO NOT EVALUATE) the integral(s) to compute the area of this region.

4. **(10 pts)** The temperature of an ice cream sandwich as a function of time $t$ ($t = 0$ being when it is removed from the freezer) is given by

   $$T(t) = \frac{60t}{1 + 4t^2}$$

   for $0 \leq t \leq 1/2$. What is the average temperature over this time period?
5. **(10 pts)** Consider the region bounded by the graphs $y = e^x$, $y = 1 - x$, $x = 0$ and $x = 1$. Set up (but DO NOT EVALUATE) the integral to compute the volume of the solid obtained by revolving this region around the $x$-axis.

6. **(15 pts)** Consider the region bounded by the graphs of $y = x$, $y = (x - 2)^2$, and $y = 0$. Set up (but DO NOT EVALUATE) the integral(s) to compute the volume of the solid obtained by revolving this region about the $x$ axis.