Makeup Exam
For First Skills Exam

1. Let $I = \int_0^4 (3x-2)dx$.
   (a) (4) Write out R_4, but don't compute its value.
   (b) (4) Use theorem 1 to estimate the error in using R_4 to estimate I.
   (c) (4) According to Theorem 1, what is the least value of n such that $|I - R_n| \leq 0.0001$?
   (d) (4) What is the maximum error given by Theorem 2 for this estimate?
   (e) (4) According to Theorem 2, what is the least value of n such that $|I - R_n| \leq 0.0001$?

2. Let $f(x) = 1 - x^2$.
   (a) (6) Sketch the graph of $f(x)$.
   (b) (6) Find the area of the region bounded by f and the line $y = -3$.
   (c) (6) Calculate $\int_{-2}^{2} f(x)dx$.

3. (6) The velocity of a car moving along a line is given by $v(t) = 10 + e^t$ mph.
   (a) How far will the car go in the time $t = 0$ to $t = 5$?
   (b) Find the average value of the function $v(t)$ over the time interval $[0, 5]$.

4. (6) Verify that $\sin(x) - x\cos(x) + 10$ is an antiderivative of $x\sin(x)$.

5. Integrate:
   (a) (4) $\int x\left(x^2-1\right)^{99} dx$
   (b) (4) $\int \frac{x+3}{\left(x^2+6x\right)^2} dx$
   (c) (4) $\int \sqrt{x-1}dx$
   (d) (6) $\int_0^3 \frac{1}{2x+3} dx$
   (e) (4) $\int \frac{1}{x\sqrt{\ln x}} dx$
   (f) (4) $\int \frac{x^2}{\sqrt{1-x}} dx$
   (g) (4) $\int \frac{x}{\sqrt{x^2+1}} dx$
   (h) (4) $\int e^x \sin\left(e^x\right) dx$
   (i) (4) $\int \frac{\sin x}{1+\cos^2 x} dx$
   (j) (6) $\int_0^4 \frac{1}{(x-6)^3} dx$