Answers to Test 1 Review Problems

1. Let $F(x) = \int_0^x f(t)\,dt$ where $f(t)$ is the function graphed on your review sheet.

   (a) Give exact values for the following:

   i. $F(2) = -2$
   ii. $F(-5) = .5$
   iii. $F'(-4) = -1$

   (b) On which subinterval(s) of $[-5, 5]$, if any, is F increasing? $(-3.5, 0)$ and $(3.5, 5)$

   (c) On which subinterval(s) of $[-5, 5]$, if any, is the graph of F concave down? $(-3, 2)$

3. Evaluate each of the integrals below using either substitution or parts as necessary. Be sure to indicate your u and du values for substitution and your u du, v and dv values for parts. You may check your answers with your calculator.

   (a) $\int \frac{(ln\,x)^2}{x}\,dx = \frac{(ln\,x)^3}{3} + C$

   (b) $\int_1^4 x(x-3)^2\,dx = \int_1^4 x^3 - 6x^2 + 9x\,dx = \frac{21}{4}$

   (c) $\int_1^8 \frac{(1+\sqrt{x})^3}{\sqrt{x}}\,dx = \frac{72\sqrt{2}+97}{2}$

   (d) $\int e^x\sqrt{e^x+5}\,dx = \frac{2(e^x+5)^{1.5}}{3} + C$

   (e) $\int_0^2 \frac{x+3}{x+10}\,dx = \int_0^2 \left(\frac{x}{x+10} + \frac{3}{x+10}\right)\,dx = .7237$

   (f) $\int \frac{arctan(x)}{1+x^2}\,dx = \frac{(arctan\,x)^2}{2} + C$

   (g) $\int \frac{cos\,x}{\sqrt{1-sin^2x}}\,dx = \pm x + C$

4. Let $I = \int_1^2 f(x)\,dx$ where $f(x) = sin(ln\,x)$

   (a) Sketch a graph showing $f(x)$ and illustrate the *left sum* approximation L_6 for I. Then use "Σ" notation to write out L_6.
   $L_6 = \Sigma_{i=0}^{5}\, sin(ln(1 + (i/6)))(1/6)$

   (b) Rank the values of L_{100}, R_{100}, and T_{100} in order of increasing size and explain, using sketches, how your ranking can be determined using only graphical information. Which of these approximations will be most accurate? Why?
   $L_{100} < T_{100} < I < M_{100} < R_{100}$ M_{100} will be most accurate.

   (c) $L_{10} = .33726$; $|I - L_{10}| < .05$; (Using $K_1 = 1$)

   (d) For R_n, $n \geq 100$; for M_n; $n \geq 3$ (Using $K_2 = 1$)