Math 112 – Fall 2011
Examination 2

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(12 pts.) Determine whether the following sequences $\{a_n\}$ are convergent or divergent. Find the limit of any convergent sequences.

    a. $a_n = \dfrac{\ln(n)}{\sqrt{n}}$ **b.** $a_n = \ln(2n) - \ln(n+1)$

2.(18 pts.) Consider the integral $\displaystyle\int_1^5 \dfrac{1}{x^2 + x}\,dx$.

    a. Evaluate this integral.

    b. Estimate this integral using the trapezoid rule with $n = 4$ steps.

    c. Estimate this integral using Simpson's rule with $n = 4$ steps.

3.(14 pts.) Evaluate the following integrals:

    a. $\displaystyle\int \dfrac{1}{\sqrt{1 + 9x^2}}\,dx$ **b.** $\displaystyle\int \dfrac{x^2}{(x - 1)^3}\,dx$

4.(14 pts.) Evaluate the following integrals:

    a. $\displaystyle\int x \arctan(x)\,dx$ **b.** $\displaystyle\int \dfrac{x^2}{(4 - x^2)^{\frac{3}{2}}}\,dx$

5.(14 pts.) Evaluate the following integrals:

    a. $\displaystyle\int \dfrac{4x - 8}{x^3 + 4x}\,dx$ **b.** $\displaystyle\int x \cosh(x)\,dx$

6.(14 pts.) Evaluate the following integrals if they are convergent or show they are divergent:

    a. $\displaystyle\int_0^\infty x e^{-x^2}\,dx$ **b.** $\displaystyle\int_0^{\frac{\pi}{2}} \tan(x) \sec^2(x)\,dx$

7.(14 pts.) Determine whether the following integrals are convergent or divergent. If you use a convergence or divergence test, please state which test you are using.

    a. $\displaystyle\int_1^\infty \dfrac{e^{\frac{1}{x}}}{x^3}\,dx$ **b.** $\displaystyle\int_1^\infty \dfrac{x}{\sqrt{x^3 + 2}}\,dx$