MAT 162 EXAM I

1. Evaluate, using substitution: $\int_0^1 \frac{5u}{1+u^2}\,du$.
2. Determine if the integral $\int_1^\infty \frac{x^3}{x^5+2}\,dx$. converges, or diverges, by comparing it to another integral.
3. Integrate by completing the square: $\int_0^3 \frac{dt}{8+2t-t^2}$.

Compute the following integrals, using your favorite method.

1. $\int \frac{\sin^3\phi}{\cos\phi}\,d\phi$
2. $\int \frac{\ln(\ln x)}{x}\,dx$.
3. $\int_1^2 \frac{dx}{4+x^2}$.
4. $\int_{-\pi}^{\pi} \sin^3\theta\,d\theta$.
5. $\int_0^\infty w^2 e^{-w}\,dw$.
6. $\int_0^\pi \sqrt{1+\cos\alpha}\,d\alpha$.

Do any three of the following integrals. You may use one reference, you can check your results on the computer, and you can collaborate with one other person in the class.

1. $\int \frac{dr}{1+\sqrt{r}}$.
2. $\int \frac{4dx}{x^3+4x}$.
3. $\int \frac{d\theta}{1-\tan^2\theta}$.
4. $\int \tan^3 x\,dx$.
5. $\int \frac{u}{u^2+4u+3}\,du$.
6. $\int \frac{\cos\phi}{\sin^3\phi-\sin\phi}\,d\phi$.
7. Using the substitution $u=\frac{1}{x}$, show $\int_0^\infty \frac{\ln x}{1+x^2}\,dx = 0$.
8. $\int x\sin^{-1} x\,dx$.
9. $\int \frac{d\beta}{1+\sin\beta}$.