Math 105 - Practice Midterm 2

1 Compute the following:

   a $\frac{d}{dx}\int_x^2 \frac{1}{1+t^3}dt$

   b $\int_{-\infty}^{\infty} x\,dx$

   c $\int_0^\infty \frac{dx}{x^{1/2}+x^{3/2}}$

   d $\int \frac{dy}{1+\cos(4y)}$

   e $\int (\ln(x^8))^5 dx$

   f $\int (\tan^2 t \sec t - \tan^3 t \sec t)dt$

   g $\int \frac{dy}{y(y^2-1)}$

   h $\int_{-2}^3 \frac{dw}{w}$

   i $\int (100-x^2)^{3/2}dx$

   j The cumulative distribution function and standard deviation of X the number of "heads" in 4 flips of a fair coin.

2 Use Simpson's rule with $n=6$ to approximate $\int_0^1 \sqrt{1+x}\,dx$. Use the error bound formula to bound the error in your approximation.

3 You deposit $\$10,000$ into a bank account that is compounded continuously at rate 0.02. After this initial deposit, you withdraw money at a constant rate of $\$W$ per year. After 11 years, your account is empty. What was your withdrawal rate?

4 Consider $f(x) = A\sin^2 x$ on $[0, 2\pi]$. For what value of A is $f(x)$ a probability density function for a random variable X on $[0, 2\pi]$? For this value of A, what are the mean and variance of X?

5 In a large clinical trial, the resting heart rate of the patients was normally distributed with a mean of 70 bpm and standard deviation of 6 bpm. What is the median heart rate? What is the 75th percentile? What fraction of patients had resting heart rates below 60?