Math 1272 Lecture 30 Quiz 3

February 13, 2014
Name: SOLUTIONS

Time allowed: 15 minutes. Good Luck!

1. (30%) Evaluate

$$\int \frac{dx}{1+e^{5x}}$$

$u = e^{5x}$
$du = 5e^{5x}dx$

$$\int \frac{du}{5e^{5x}(1+u)} = \frac{1}{5}\int \frac{du}{u(1+u)}$$

$$= \frac{1}{5}\left[\int \frac{1}{u}du - \int \frac{du}{1+u}\right]$$

$$= \frac{1}{5}\left[\ln(u) - \ln(1+u)\right]$$

$$= \frac{1}{5}\left[5x - \ln(1+e^{5x})\right]$$

2. (30%) Which of the following is true for

$$\int_3^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}}dx?$$

(a) The limit exists and it is finite.

(b) The limit exists and it is ∞.

(c) The limit exists and it is $-\infty$.

(d) The limit does not exist.

Explain your answer *carefully*, stating all results that you are using.

$u = \sqrt{x}$ $\quad dx = \frac{1}{2}\sqrt{x}\,dx$

$$= \frac{1}{2}\int_{\sqrt{3}}^{\infty} e^{-u}du = \frac{1}{2}\left[\lim_{t\to\infty}\left[\cancelto{0}{e^{-t}} + e^{-\sqrt{3}}\right]\right] = \frac{1}{2e^{\sqrt{3}}}$$

SEE OTHER SIDE FOR MORE PROBLEMS

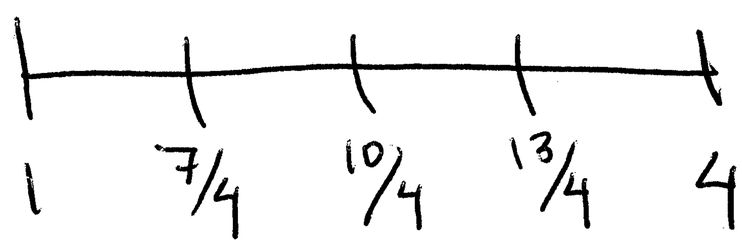
3.

(a) (30%) Apply Simpson's rule to approximate

$$\int_1^4 \tan(x^2)dx$$

with $n = 4$. Write your answer as a sum of tangent functions.

$$\Delta x = \frac{4-1}{4} = \frac{3}{4}$$



$$\frac{\Delta x}{3}\left[\tan(1^2) + 4\tan\left(\left(\tfrac{7}{4}\right)^2\right) + 2\tan\left(\tfrac{10}{4}\right)^2 + 4\tan\left(\tfrac{13}{4}\right)^2 + \tan(4)^2\right]$$

(b) (10%) As $n \to \infty$, how quickly does the error in Simpson's rule go to 0, in terms of a power of n? (You don't need to give the other coefficients.)

Since $|E_S| \leq \frac{K(b-a)^5}{180\, n^4}$ the error goes to 0 like $\frac{1}{n^4}$ goes to 0.