Review Problems

February 22, 2017

1. (Fall 2002, Exam 2, #5) True or false: The Simpson's rule approximation to $\int_0^\pi x \sin x \, dx$ with $n = 6$ is $\dfrac{\pi}{18}\left(0 + \frac{\pi}{3} + \frac{\sqrt{3}}{3}\pi + 2\pi + \frac{2\sqrt{3}}{3}\pi + \frac{5}{3}\pi + 0\right)$.

2. (Fall 2002, Exam 2, #6) True or false: The Midpoint rule approximation to $\int_0^2 \dfrac{x}{x+1} \, dx$ with $n = 4$ is $\frac{5}{6}$.

3. (Fall 2002, Exam 2, #7) Evaluate $\int_0^\infty x^2 e^{-x^3} \, dx$.

4. (Fall 2008, Exam 2, #4) Use the Trapezoid Rule with $n = 3$ to compute the approximate value of $\displaystyle\int_{-1/2}^{1} x^2 \, dx$.

5. (Fall 2008, Exam 2, #6) Which statement about $\displaystyle\int_1^\infty \frac{dx}{x^2 + x}$ is true?

   (a) The integral diverges by comparison with $\int_1^\infty \dfrac{dx}{x}$.

   (b) The integral converges, by comparison with $\int_1^\infty \dfrac{dx}{x}$.

   (c) The integral converges, by comparison with $\int_1^\infty \dfrac{dx}{x^2}$.

   (d) The integral diverges, by comparison with $\int_1^\infty \dfrac{dx}{x^2}$.

   (e) None of the above statements is true.

6. (Fall 2009, Exam 2, #11) Which of the following integrals diverge?
   (I) $\displaystyle\int_{-1}^{1} \frac{1}{x} \, dx$ (II) $\displaystyle\int_1^\infty \frac{1}{e^x} \, dx$ (III) $\displaystyle\int_\pi^\infty \frac{\sin^2 x}{x^2} \, dx$

7. (Fall 2010, Exam 2, #9) Which of the following improper integrals converge?
   (I) $\displaystyle\int_1^\infty \frac{x^2 + 2x + 1}{x^5 + 1} \, dx$ (II) $\displaystyle\int_{-1}^{1} \frac{1}{x^3} \, dx$ (III) $\displaystyle\int_1^\infty e^{-x} \cos^2 x \, dx$