Math 1b. Approximate Integration

Spring 2006

1. Consider $I = \int_0^1 \sin(x^2)\,dx$.

   (a) Complete the following table.

x	0.0625	0.125	0.1875	0.25
$\sin(x^2)$	0.00390624	0.01562436	0.03514901	
x	0.3125	0.375	0.4375	0.5
$\sin(x^2)$	0.09750110		0.19023965	
x	0.5625	0.625	0.6875	0.75
$\sin(x^2)$	0.31115322		0.45525291	
x	0.8125	0.875	0.9375	1.0
$\sin(x^2)$	0.61324028		0.77004153	

   (b) If $n = 8$, use a Left Sum to estimate I.

   (c) If $n = 8$, use a Right Sum to estimate I.

   (d) If $n = 8$, use the Midpoint Rule to estimate I.

   (e) If $n = 8$, use the Trapezoid Rule to estimate I.

   (f) If $n = 8$, use Simpson's Rule to estimate I.

2. Let $I = \int_0^1 \sin(x^2)\, dx$.

   (a) How many subdivisions are needed to assure that the error is less than 10^{-6} if we use the Midpoint Rule to estimate I?

   (b) How many subdivisions are needed to assure that the error is less than 10^{-6} if we use the Trapezoid Rule to estimate I?

   (c) How many subdivisions are needed to assure that the error is less than 10^{-6} if we use Simpson's Rule to estimate I?