EMT 121

Exam 2

July 8, 2009

1. (a) Evaluate $\int_{\sqrt{2}}^{15} 18x\,dx$

   (b) Evaluate $\int x\sqrt{3x^2+2}\,dx$

   (c) If $g(x) = \int_0^x \arctan(3t)\,dt$. Find $g'(\frac{1}{3})$ and $g''(\frac{1}{3})$.

2. Consider the region R, in the first quadrant, bounded above by $y = 2x$ and below by $y = x^2$.

   (a) Find the area of R.

   (b) Find the volume of the solid that is obtained by rotating R about the y-axis.

3. Evaluate each of the following integrals.

   (a) $\int_0^1 x\cos(ax)\,dx$

   (b) $\int \frac{30}{x^2 - 25x + 100}\,dx$

   (c) $\int \sec^3(\theta)\tan(\theta)\,d\theta$

   (d) $\int \frac{x-1}{x(x+1)^2}\,dx$

   (e) $\int \frac{2x-1}{2x^2-2x+3}\,dx$

   (f) $\int \sqrt{e^3x}\,dx$

   (g) $\int \frac{x^{\frac{2}{3}}}{x+1}\,dx$

4. Determine whether the following integrals converge or diverge.If the integral converges, evaluate it.

   (a) $\int_0^\infty e^{-2x}\,dx$

   (b) $\int_0^{\frac{\pi}{2}} \sec t\tan t\,dt$

(c) $\int_0^2 \frac{dx}{(x-1)^2}$

5. Given the function f at the following values:

x	1.8	2.0	2.2	2.4	2.6
$f(x)$	3.12014	4.42569	6.04241	8.03014	10.46675

Approximate $\int_{1.8}^{2.6} f(x)\,dx$ using

(a) the Trapezoidal rule

(b) Simpson's rule

6. Use the Trapezium Rule with $n = 4$ to approximate $\int_1^2 x \ln x\, dx$

7. For each of the following series , determine whether it converges or diverges.

(a) $\sum_{n=4}^{\infty} \frac{1}{n}$

(b) $\sum_{n=1}^{\infty} \frac{1}{n^2+4n+3}$

(c) $\sum_{n=1}^{\infty} \frac{1}{n!}2^n$

(d) $\sum_{n=1}^{\infty} \frac{n^2}{n^2+10000}$

(e) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$

(f) $\sum_{n=1}^{\infty} \frac{1}{n+6}$

(g) $\sum_{k=1}^{\infty} \frac{3}{5k}$

(h) $\sum_{k=1}^{\infty} \frac{k}{1+k^2}$

(i) $\sum_{k=3}^{\infty} \frac{\ln k}{k}$

8. Find the sum of

(a) $\sum_{n=1}^{\infty} \frac{1}{2^n} + \frac{1}{4^n}$

(b) $\sum_{n=1}^{\infty} \frac{1}{5^n} - \frac{1}{n(n+1)}$

9. Determine the radius of convergence of the following Power Series.

$$\sum_{n=1}^{\infty} \frac{n}{6^n}(x-3)^n$$