MA 114 Worksheet #08: Review for Exam 01

1. Find the following antiderivatives

   (a) $\displaystyle\int x^2 \sin 2x \, dx$

   (b) $\displaystyle\int x e^{2x} \, dx$

   (c) $\displaystyle\int \frac{dx}{x^2 + 2x + 10}$

   (d) $\displaystyle\int \frac{x+3}{(x-6)(x-3)} \, dx$

   (e) $\displaystyle\int \frac{3x+6}{x^2 - 10x + 24} \, dx$

   (f) $\displaystyle\int \frac{3x^2 + 9x + 8}{x^2(x+2)^2} \, dx$

   (g) $\displaystyle\int \sin^5 x \cos x \, dx$

   (h) $\displaystyle\int \sin^2 x \, dx$

   (i) $\displaystyle\int \frac{dx}{x\sqrt{x^2 + 9}}$

   (j) $\displaystyle\int \sqrt{16 + 4x^2} \, dx$

   (k) $\displaystyle\int x^3 \sqrt{9 - x^2} \, dx$

   (l) $\displaystyle\int_1^2 \frac{dx}{x \ln x}$
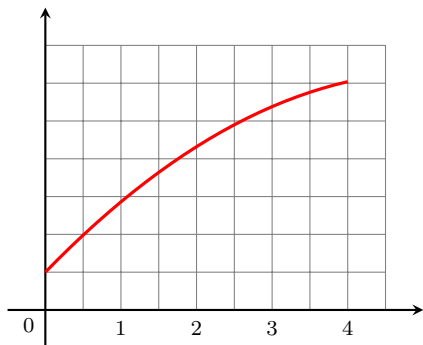
   (m) $\displaystyle\int_1^\infty x e^{-2x} \, dx$

2. Let $f(x) = e^{-x^2}$. What is the smallest N we should use in the trapezoid rule to compute

$$\int_0^1 e^{-x^3} \, dx$$

   accurate to within 0.0001? Hint: $|f(x)| \le 1$ and $|f'(x)| \le 2$ on $[0, 3]$.

3. Calculate M_6 and T_6 to approximate $\displaystyle\int_{-2}^1 e^{x^2} \, dx$.

4. Let $I = \int_0^4 f(x)\, dx$, where f is the function whose graph is shown below. For any value of n, list the numbers L_n, R_n, M_n, and T_n in increasing order.

5. An airplane's velocity is recorded at 5-minute intervals during a 1 hour period with the following results, in miles per hour:

$$550, \quad 575, \quad 600, \quad 580, \quad 610, \quad 640, \quad 625,$$
$$595, \quad 590, \quad 620, \quad 640, \quad 640, \quad 630$$

Use Simpson's Rule to estimate the distance traveled during the hour.

6. For which values of p does the improper integral

$$\int_0^\infty \frac{dx}{(1+x)^p}\, dx$$

converge?