

MA114 Summer 2018
Worksheet 8 – Exam 1 Review – 6/20/18

1. Compute the following definite integrals, antiderivatives, and improper integrals.

a) $\int \frac{1}{x^2 + 2x + 10} dx$

i) $\int \frac{dx}{\sqrt{6 - x^2}}$

b) $\int \cos^2(x) dx$

j) $\int_1^2 \frac{1}{x \ln(x)} dx$

c) $\int \frac{1}{x\sqrt{x^2 + 9}} dx$

k) $\int \frac{x + 3}{(x - 6)(x - 3)} dx$

d) $\int_0^{-1} \frac{e^{1/x}}{x^3} dx$

l) $\int \sqrt{16 + 4x^2} dx$

e) $\int x^3 \sqrt{9 - x^2} dx$

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

f) $\int_1^\infty x e^{-2x} dx$

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

g) $\int \sin^2(x) \sin(2x) \cos(x) dx$

Hint: $\sin(2x) = 2 \sin(x) \cos(x)$

h) $\int 6x^2 \cdot \frac{\cos(2x^3 - 5)}{\sin(2x^3 - 5)} dx$

o) $\int_0^\pi x^2 \sin(2x) dx$

2. Sketch the graph of the function $f(x) = x^2$ on $[0, 4]$ as well as the approximations L_4 , R_4 , M_4 , and T_4 . Compute M_4 and T_4 .

3. 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? Remember the error formula

$$|E_{TN}| \leq \frac{K(b - a)^3}{12N^2}.$$

Hint: $|f(x)| \leq 1$, $|f'(x)| \leq 2$, and $|f''(x)| \leq 9$ on $[0, 1]$.

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

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

Use Simpson's Rule to estimate the distance traveled during the hour. Be careful with your units.

5. For which values of q does the improper integral

$$\int_0^{\infty} \frac{dx}{(1+x)^{2q}}$$

converge?