Math 175 – Review Questions for Exam 2

1. Evaluate the following trigonometric integrals:

\[ \int \tan^3 x \sec^{3/2} dx \quad \int \cos^5(2x) \sin^2(2x) dx \quad \int \cos^4(3x) dx \]

2. Use a trigonometric substitution to evaluate \( \int \frac{dx}{\sqrt{x^2 + 4}} \).

3. Rewrite the integral \( \int x^2 \sqrt{4x^2 - 1} \, dx \) as a trigonometric integral using an appropriate substitution. You need not actually evaluate the resulting trigonometric integral.

4. The integral \( \int x^3 \sqrt{4 - x^2} \, dx \) can be rewritten using the substitution \( x = 2\sin \theta \) as \( 32 \int \sin^3 \theta \cos^2 \theta \, d\theta \). Evaluate this integral and convert your answer back into an antiderivative of \( x^3 \sqrt{4 - x^2} \) in terms of the variable \( x \).

5. Evaluate the following using integration by partial fractions:

\[ \int \frac{dx}{x(x+1)(x-2)} \quad \int \frac{x+6}{x^3+3x} \, dx \quad \int \frac{x+34}{(x-2)^2(x+2)} \, dx \]

6. Estimate \( \int_0^2 x^2 \, dx \) numerically

   (a) using the midpoint rule with \( n = 4 \) (four rectangles).

   (b) using the trapezoid rule with \( n = 6 \) (six trapezoids).

7. Evaluate the following improper integrals:

\[ \int_2^\infty \frac{x}{(x^2 + 3)^2} \, dx \quad \int_2^3 \frac{dx}{(x-2)^{3/2}} \]