1. \((15 \text{ points})\) Write out the sums with 10 terms which are the (a) left-hand and (b) right-hand Riemann sums of length ten for the definite integral \(\int_0^3 5x^2 + 5 \, dx\). (You should not evaluate the sums.)

2. \((10 \text{ points})\) Use the interpretation of certain integrals as areas to find \(\int_0^3 \sqrt{3 - x^2} \, dx\).

3. \((15 \text{ points})\) Our textbook has a table of indefinite integrals on its back flap, one of which is:

\[
\int \sin^2(u) \, du = \frac{1}{2} u - \frac{1}{4} \sin(2u) + C.
\]

Briefly explain how you can verify this formula, then carry out the verification.

4. \((30 \text{ points})\) Compute each of the following integrals, or explain why they don’t exist.
   (a) \(\int_1^4 \frac{1}{x^2} - \sqrt{x} \, dx\)
   (b) \(\int 2 \sin(x) - 3 \cos(x) \, dx\)
   (c) \(\int_0^5 |t - 2| \, dt\)
   (d) \(\int \sec^2(3\theta) \, d\theta\)
   (e) \(\int_0^1 \frac{x}{(1 + x^2)^3} \, dx\)

5. \((20 \text{ points})\) (a) Draw a sketch of the region under the parabola \(y = (1 - x)(x - 2)\) above the \(x\)-axis. Then compute the area of the region. (b) Evaluate \(\int_0^3 (1 - x)(x - 2) \, dx\). Explain what this integral represents in terms of the areas of regions in the plane.

6. \((5 \text{ points})\) Work the indefinite integral \(\int \frac{1}{\sqrt{3x-1}} \, dx\) by making the substitution \(u = \sqrt{3x-1}\). Clearly indicate the steps used in the substitution.

7. \((5 \text{ points})\) Determine the value of the definite integral \(\int_1^7 f(x) \, dx\) given the following information:
   (i) \(f(x)\) is continuous for \(-3 \leq x \leq 7\),
   (ii) the average value of \(f\) on the interval \([-3, 1]\) is 2, and
   (iii) the average value of \(f\) on the interval \([-3, 7]\) is 5.