On the front of your bluebook print (1) your name, (2) your student ID number, (3) your instructor's name (Bianchi), (4) your section number, and (5) a grading table (see front board). Show all work in your bluebook and BOX IN YOUR FINAL ANSWERS where appropriate. A correct answer with no supporting work may receive no credit while an incorrect answer with some correct work may receive partial credit. Textbooks, class notes, calculators, and crib sheets are not permitted. There are a total of five problems on both sides of this paper and a total of 100 points. Please start each of the five problems on a new page.

1. (20 Points) Answer the following Always True (T) or False (F). Only your final answer will be graded on these problems.

    (a) $x = 5\sin(t) - 2$, $y = 5\cos(t) + 1$ is a parameterization of a circle with radius 5 and center $(-2, 1)$ traced counter-clockwise.

    (b) $\int_{-2}^{2} \frac{1}{x^2} dx = \left[-\frac{1}{x} \right]_{-2}^{2} = \left(-\frac{1}{2} \right) - \left(-\frac{1}{-2} \right)$.

    (c) $\frac{d}{dt} \left[\int_{2}^{5} \frac{t}{t+1} \cos(2t) dt \right] = 0$

    (d) For any continuous function $f(x)$, $\int_{a}^{b} f(x) dx$ gives the area between the curve of $f(x)$ and the x-axis for $a \geq x \geq b$.

    (e) $\frac{d}{dx} \left[\int_{2}^{x} f(t) dt \right] = \frac{d}{dx} \left[\int f(x) dx \right]$ for all $x > 2$.

2. Assume $\int_{-3}^{5} f(x) dx = 6$, $\int_{3}^{5} f(x) dx = 4$, and $f(x)$ is an even function. Find the values of the following integrals. Be sure to show your work.

    (a) (5 points) $\int_{-3}^{3} f(x) dx$.

    (b) (5 points $\int_{5}^{-3} f(x) dx$.

    (c) (5 points) $\int_{-5}^{3} f(x) dx$.

3. Solve the following unrelated problems.

    (a) (9 points) $\frac{dy}{dx}$ if $y = \cos(\arcsin(x^2))$.

    (b) (9 points) $\int_{3}^{10} g(x) dx$ using the graph of $g(x)$ below.

    (c) (9 points) Estimate $\int_{-1}^{2} (7 - x^2) dx$ using a Reimann Sum with $n = 3$ subintervals using left endpoints. Without evaluating the integral, determine if this approximation is an overestimate or an underestimate?

    (d) (9 points) If $g(x)$ is graphed below and $g(x) = G'(x)$ and $G(5) = 2$, find $G(7)$.

    (e) (9 points) $\lim_{x \to 1^+} \frac{\ln(x)}{\sqrt{x - 1}}$

4. (10 points) A sheet of paper contains 18 square feet. The top and bottom margins are 9 inches and the side margins are 6 inches. What are the dimensions of the page that has the largest printed area?

5. (10 points) A 10 foot long ladder is leaning against the outside wall of a house. Suddenly the base of the ladder starts to slide away from the building. If the base is sliding away at a rate of 3 feet per second, how fast is the top of the ladder falling when it is 1 foot above the ground?