1. (10pts) The function $f(x) = x^2 - 16$, $3 \le x \le 6$ is given.
a) Find the Riemann sum for the function with $n = 3$, taking sample points to be midpoints.
b) Illustrate with a diagram, where appropriate rectangles are clearly visible.
c) What does the Riemann sum represent?

2. (2pts) Simplify using part 1 of the Fundamental Theorem of Calculus:

$$\frac{d}{dx} \int_2^x \frac{t^{14}}{t^6 + 4} \, dt =$$

3. (4pts) Write in sigma notation.

$$\frac{9}{5} + \frac{16}{6} + \frac{25}{7} + \frac{36}{8} + \frac{49}{9} =$$

4. (8pts) Find $\int_{-2}^{2}(x+1)\,dx$ in two ways (they'd better give you the same answer!):
a) Using the "area" interpretation of the integral. Draw a picture.
b) Using the Fundamental Theorem of Calculus.

5. (5pts) Find $f(x)$ if $f'(x) = x^3 - 3x$ and $f(2) = 5$.

Evaluate the following definite and indefinite integrals.

6. (4pts) $\displaystyle\int 5\sec^2 x - e^x \, dx =$

7. (6pts) $\displaystyle\int_1^3 \frac{x^4 - 1}{x^2} \, dx =$

8. (6pts) Let $v(t) = \sqrt{t} - 1$ be the velocity of an inebriated snail (in millimeters per minute).
a) Calculate $\int_1^4 v(t) \, dt$ and state what it represents.
b) If the snail is 5mm away from a strawberry at time $t = 1$, and is moving away, what is its position at time $t = 4$?

9. (5pts) Use the substitution rule to evaluate the indefinite integral.

$$\int \frac{\sin(\ln x)}{x}\, dx =$$

Bonus. (5pts) The graph of a function f is drawn below. Let $g(x) = \int_1^x f(t)\, dt$.
a) Fill in the table with values of g (note: NOT values of f).
b) Draw a nice graph of g, using values in the table and paying attention to where g is increasing/decreasing, concave up/down.

x	0	1	2	3	4
$g(x)$					

y=f(x)