1. Assume that $\int_2^5 f(x)dx = 6$, $\int_{-1}^2 f(x)dx = 9$, $\int_{-1}^5 g(x)dx = 2$, and $\int_2^5 g(x)dx = -8$. Find

   (a) $\int_{-1}^5 f(x)dx$

   (b) $\int_{-1}^2 g(x)dx$

   (c) $\int_2^5 [3f(x) - 2g(x)]\,dx$

   (d) $\int_{-1}^5 [2g(x) + f(x)]\,dx$

2. Find the derivative of each of the following.

   (a) $\frac{d}{dx}\int_3^{5x^2} \sqrt{4t-1}dt$

   (b) $\frac{d}{dx}\int_{7x-3}^{3x+1} \frac{1}{t}dt$

3. Evaluate the following definite integrals.

(a) $\int_{-2}^{1} (2x - 3)\ dx$

(b) $\int_{1}^{4} \left(x\sqrt{x} - 2\right)\ dx$

(c) $\int_{1}^{2} \left(\frac{x-1}{x^3}\right)\ dx$

(d) $\int_{3}^{5} \sqrt{2x-5}\ dx$

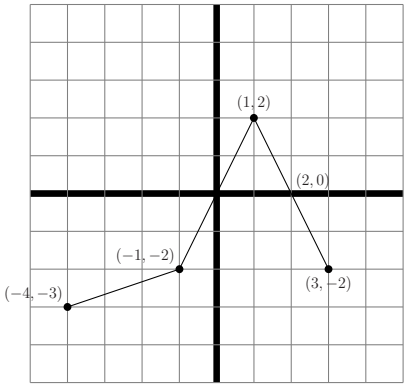
(e) $\int_{-1}^{0} \frac{8x + 22}{(2x^2 + 11x - 5)^2}\ dx$

(f) $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \sin(2x)\cos(2x)\ dx$

(g) $\int_{\frac{\pi}{2}}^{\frac{3\pi}{4}} \csc(x)\cot(x)\ dx$

(h) $\int_{\frac{\pi}{9}}^{\frac{\pi}{9}} \sin\left(x^2\right)\ dx$

4. (From the 2005 AP Calculus AB exam.) The graph of the function f below consists of three line segments.



(a) Let g be the function given by $g(x) = \int_{-4}^{x} f(t)\,dt$. Find the value of each of the following or state that it does not exist.

(i) $g(-1)$

(iii) $g''(-1)$

(ii) $g'(-1)$

(iv) $g''(2)$

(b) For the function g defined above, find the x-coordinate of each point of inflection of the graph of g on the open interval $-4 < x < 3$. Show your work and/or reasoning.

5. (Adapted from the 2007 AP Calculus AB exam.) Assume that the functions f and g are differentiable for all real numbers, and that g is strictly increasing. The table below gives values of the functions and their first derivatives at selected values of x. Let w be the function given by $w(x) = \int_1^{g(x)} f(t)\,dt$. Find the value of $w'(3)$.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	6	4	2	5
2	9	2	3	1
3	10	-4	4	2
4	-1	3	6	7

6. (From the 2005 AP Calculus AB exam.) The tide removes sand from Sandy Point Beach at a rate modeled by the function R. A pumping station adds sand to the beach at a rate modeled by the function S. Both $R(t)$ and $S(t)$ have units of cubic yards per hour and t is measured in hours for $0 \le t \le 6$. At time $t = 0$, the beach contains 2500 cubic yards of sand.

   (a) Write an expression for $Y(t)$, the total number of cubic yards of sand on the beach at time t, in terms of R and S.

   (b) Let $R(t) = 2 + 5\sin\left(\frac{4\pi t}{25}\right)$. How much sand will the tide remove from the beach during this 6-hour period? Indicate the units of measure and give your answer rounded to the nearest tenth.