Math 261 – Summer Lab 19 **Definite Integrals** Name_____

Show all work for credit. Also, give exact answers unless otherwise noted.

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 the following:

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

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

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

   (d) Assume f and g are continuous on [–1, 5], find the average value of $2g + f$ on [–1, 5].

2. Find each of the following.

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

   (b) $\int_3^5 \frac{d}{dt}\left[\sqrt{4t-1}\right]dt$

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

   (d) $\int_3^{5x^2} \frac{d}{dt}\left[\sqrt{4t-1}\right]dt$

3. Evaluate the following definite integrals.

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

   (b) $\int_1^4 \left(t\sqrt{t} - 2\right)dt$

(c) $\int_1^2 \left(\frac{p-1}{p^3} \right) dp$

(d) $\int_3^5 \sqrt{2z-5}\, dz$

(e) $\int_{-1}^{0} \frac{8a+22}{\left(2a^2+11a-5\right)^2} da$

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

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

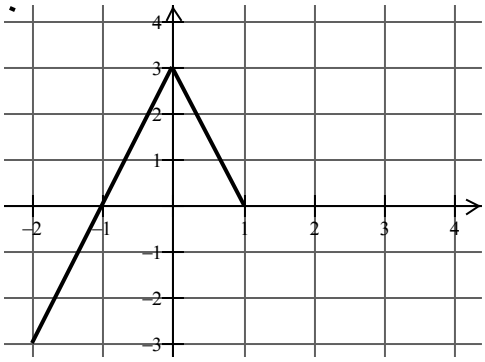
(h) $\int_{\frac{\pi}{9}}^{\frac{\pi}{9}} \sin(y^2) dy$

(i) $\int_0^{\pi} \tan\varphi d\varphi$

(j) $\int_0^3 \sec(2) dx$

4. The graph of the function *f*, consisting of three line segments, is given below.

Let g be a function defined by $g(x) = \int_1^x f(t)\,dt$.



(a) Find the value of each of the following, if possible. Justify.

(i) $g(1)$

(ii) $g(-2)$

(iii) $g(4)$

(iv) $g'(-1)$

(v) $g'(0)$

(vi) $g''(-1)$

(vii) $g''(0)$

(viii) $g''(2)$

(b) Find the absolute maximum value of g on $[-2, 4]$. Justify your answer.

(c) Find the x-coordinate of each point of inflection of the graph of g. Justify your answer.