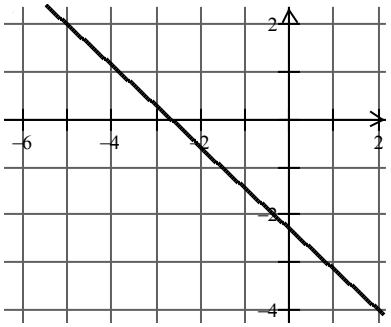
Math 261 – Summer Lab 16 **Antiderivatives (Indefinite Integration)** Name_____

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

1. Determine an antiderivative of the function defined by the following graph.



2. Evaluate each of the following.

(a) $\int (3x^2 + 2x + 1)dx$

(b) $\int \left(\frac{3}{t^3} + 2t + 1 \right) dt$

(c) $\int 5\sin\varphi \, d\varphi$

(d) $\int \frac{p^2 - 2p + 5}{\sqrt{p}} dp$

(e) $\int (2z + 3)^2 \, dz$

(f) $\int \frac{1}{\sin^2\theta} d\theta$

(g) $\frac{d}{dx}\int\left(x^2+4\right)^5\,dx$

(h) $\int\frac{d}{dx}\left(\tan\left(x^2+7\right)\right)dx$

(i) $\int k^3dx$

(j) $\int k^3dk$

4. Solve each differential equation subject to the given conditions.

(a) $\frac{dy}{dx}=\frac{1}{\sqrt{3x+1}}$; $y=2$ when $x=1$

(b) $g''(\alpha)=3\cos\alpha-2\sin\alpha$; $g'\left(\frac{\pi}{2}\right)=5$; $g\left(\frac{\pi}{3}\right)=4$

5. Jill throws a rock straight upward alongside of a tree. She releases the rock from a point six feet above ground level. The rock rises until it is even with the top of the tree then falls back to the ground. It remains aloft for 4 seconds. How tall is the tree? (Gravity produces a constant acceleration of approximately 32 feet per second per second downward. The solution may be approximated to the nearest foot.)