

# Answers to Math 125 Winter 2007 Final

1. a.  $-\cos x + \left(\frac{1}{3}\right)\cos^3 x + C$

b.  $\frac{x^2}{2} - \left(\frac{1}{2}\right)\ln|x+1| + \left(\frac{3}{2}\right)\ln|x-1| + C$

2. a.  $\frac{1}{4}e^2 + \frac{1}{4}$

b.  $-\frac{3\sqrt{3}}{2} + \frac{\pi}{2} + 3$

3. The integral does not converge

4. a. 25 feet

b. 39 feet

5.  $\frac{4}{3}\pi(r^2 - a^2)^{3/2}$

6.  $3700\pi \cdot (13.5) \approx 157,000$  joules

7. a.  $\int_0^{2\pi/3} \sqrt{1 + 4\cos^2(2x)} dx$

b.  $\frac{\pi}{12} (5\sqrt{2} + 3\sqrt{5})$

8. centroid has coordinates  $\left(\frac{8}{3\pi}, 0\right)$

9.  $y = -2 + 9e^{(x + \frac{x^2}{2})}$

10. a.  $y'(t) = 30 - (0.01)y$

b.  $y(t) = 3000(1 - e^{-(0.01)t})$

c.  $\lim_{t \rightarrow \infty} y(t) = 3000$  grams