

**Homework questions for section 9.5, 11.1, 11.2**

*Math 104, Fall 2007*

Credit is given only if supporting work is shown. Only correct answers receive credit. No partial credit is given.

1. The lifetime of a certain type of fly is an exponential variable with probability density function

$$f(t) = 2e^{-2t}, \quad \text{for } t \geq 0,$$

with the time  $t$  measured in days. Find the probability that one such fly will live longer than 4 days.

- A)  $1/e$       B)  $1/8$       C)  $1/e^2$       D)  $\frac{1}{2}e^{-2}$       E)  $e^{-8}$       F)  $1 - e^{-4}$

2. Consider the parametrized curve given by the equations

$$x = \sin t,$$

$$y = \sin(t + \sin t).$$

The graph self-intersects at the point  $(x, y) = (0, 0)$ , and it therefore has two tangent lines at that point. What are the slopes of the two tangent lines at  $(0, 0)$ ?

- A)  $-1$  and  $1$
- B)  $0$  and  $1$
- C)  $0$  and  $2$
- D)  $-1$  and  $2$
- E)  $-1$  and  $0$
- F) Both are  $0$

3. Consider the parametrized curve

$$x = 2 \cos(t) - \cos(2t)$$

$$y = 2 \sin(t) - \sin(2t)$$

If we rotate the arc of this curve for the values  $0 \leq t \leq \pi$  around the  $x$ -axis, what is the area of the resulting surface.

Hint: to simplify the integral, make use of the identity

$$\cos u \cos v + \sin u \sin v = \cos(u - v).$$

- A)  $\frac{32}{3}\pi$     B)  $\frac{27}{4}\pi$     C)  $\frac{64}{5}\pi$     D)  $\frac{64}{3}\pi$     E)  $\frac{81}{4}\pi$     F)  $\frac{128}{5}\pi$