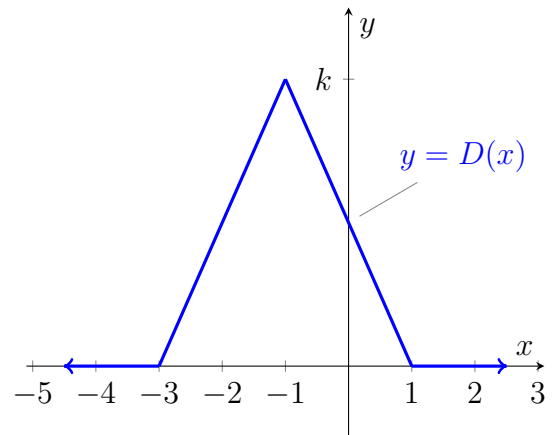Your Name: _____

1. Show that $\displaystyle\int_0^\infty \frac{4t}{(2t^2+1)^3}\, dt = 0.5.$

2. Determine whether or not $f(x)$ is a probability density function, where

$$f(x) = \begin{cases} 3 - x^2 & \text{, if } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}.$$

3. Consider the function $D(x)$ shown the graph below.

   (a) For what value of k is $D(x)$ a probability
       density function for a random variable X?

   (b) Assuming the value of k from part (a), determine $P(-1 < X < 1)$.

4. The length of time spent waiting for a red stoplight to change is a uniform random
   variable X on the interval $[0, 80]$ seconds. Write a formula for the probability density
   function $U(x)$. How often would you expect to wait less than 10 seconds for the
   stoplight to change?

5. The lifespan of an office copy machine is a random variable T having an expected value of 1.25 years and is described by an exponential probability density function. How likely is it that a copy machine's lifespan will be at least 3 years?

6. Find the expected value of the random variable Y described by density function

$$f(y) = \begin{cases} \dfrac{8}{y^3} & \text{, if } y > 2 \\ 0 & \text{otherwise} \end{cases}$$