Worksheet: Interpreting the Integral Worksheet

1. If $f(x)$ is measured in pounds and x is measured in feet, what are the units of measurement for: $\int_a^b f(x)\,dx$?

2. If f(t) is measured in metres/second^2 and t is measured in seconds, what are the units of measurement for $\int_a^b f(t)\,dt$?

3. If f(t) is measured in dollars per year and t is measured in years, what are the units of measurement for $\int_a^b f(t)\,dt$?

4. Oil is leaking out of a ruptured tanker at a rate of f(t) gallons per minute. Write a definite integral expressing the total quantity of oil which leaks out of the tanker in the first hour.

5. In an imaginary galaxy, a star is growing at a rate given by: $r(t) = (\tan t)^{t+1}$ unit mass per century. A second star grows at a rate given by: $p(t) = 2^t$ unit mass per century. Give a physical interpretation for the definite integral:

   $$\int_0^1 (2^t - (\tan t)^{t+1})\,dt$$

6. If oil is leaking from a tanker at the rate of $f(t) = 10e^{0.2t}$ gallons per hour where t is measured in hours. Write an integral that would represent the number of gallons of oil will have leaked from the tanker after the first 5 hours?

7. A bicyclist is pedaling along a straight road with velocity, $v(t) = -300x(x - \frac{1}{3})(x - 1)$, given in the diagram below. Suppose the cyclist starts 5 kilometers from a lake, and that positive velocities take her away from the lake and negative velocities toward the lake. When is the cyclist farthest from the lake, and how far away is she then?