5.10

24) $\int_0^3 \frac{dx}{x\sqrt{x}} = \lim_{t\to 0^+} \int_t^3 \frac{dx}{x^{3/2}} = \lim_{t\to 0^+} \left[\frac{-2}{\sqrt{x}}\right]_t^3 = \frac{-2}{\sqrt{3}} + \lim_{t\to 0^+} \frac{2}{\sqrt{t}} = \infty$

Divergent

29) $\int_{-2}^{3} \frac{dx}{x^4} = \int_{-2}^{0} \frac{dx}{x^4} + \int_0^3 \frac{dx}{x^4}$, but $\int_{-2}^{0} \frac{dx}{x^4} = \lim_{t\to 0^-} \left[-\frac{x^{-3}}{3}\right]_{-2}^{t} =$

$\lim_{t\to 0^-} \left[-\frac{1}{3t^3} - \frac{1}{24}\right] = \infty$ Divergent

6.7

#2 a) The probability is $\int_0^{15} f(t)\,dt$

b) $\int_{30}^{\infty} f(t)\,dt$

#4 a) $f(x) \geq 0$

$\int_{-\infty}^{\infty} f(x)dx = \int_0^{10} f(x)dx = \frac{1}{2}(10)(.2) = 1$ $f(x)$

is a probability density function

b) (i) $P(X<3) = \int_0^3 f(x)dx = \frac{1}{2}(3)(.1) = \frac{3}{20} = .15$

(ii) $P(X>8) = \int_8^{10} f(x)dx = \frac{1}{2}(2)(.1) = \frac{2}{20} = (.1)$

~~P(3~~ $P(3 \leq X \leq 8) = 1 - .15 - .10 = .75$

6) a) $\mu = 1000 \Rightarrow f(t) = \begin{cases} 0 & t<0 \\ \frac{1}{1000} e^{-\frac{t}{1000}} & t \geq 0 \end{cases}$

(c) $P(0 \leq X \leq 200) = \int_0^{200} \frac{1}{1000} e^{-t/1000}\, dt = \left[-e^{-\frac{t}{1000}}\right]_0^{200} =$

$e^{-1/5} + 1 \approx .181$

$P(X > 800) = \int_{800}^{\infty} \frac{1}{1000} e^{-\frac{t}{1000}}\, dt = \lim_{x \to \infty} \left[-e^{-\frac{t}{1000}}\right]_{800}^{x}$

$0 + e^{-4/5} \approx .449$

b) find m s.t. $\int_m^{\infty} f(t)\,dt = \frac{1}{2}$ $\lim_{x \to \infty} \int_m^{x} \frac{1}{1000} e^{-t/1000} = \frac{1}{2}$

$\Rightarrow \lim_{x \to \infty} \left[-e^{-t/1000}\right]_m^{\infty} = \frac{1}{2} \Rightarrow 0 + e^{-m/1000} = \frac{1}{2}$

$\Rightarrow -m/1000 = \ln \frac{1}{2} \Rightarrow m = -1000 \ln\left(\frac{1}{2}\right) = 1000 \ln 2 = 693.1$