Math 202(01) Solution
Quiz 7 7 April 2004

1. The amount of time between crashes for the xPear model iA computer follows an exponential distribution with mean time between crashes equal to 60 hours. My xPear has just recovered from a crash, and I want to run a weather simulation that will take 100 hours. What is the probability that my simulation will run to completion?

   Solution: The pdf we want is $f(x) = \dfrac{1}{60}e^{-\frac{t}{60}}$ for $x \geq 0$. We need to find the probability that $X \geq 100$, that is,

$$\begin{aligned} \int_{100}^{\infty} \frac{1}{60} e^{-\frac{t}{60}}\,dt &= \lim_{w\to\infty} \frac{1}{60}\left[-60e^{-\frac{t}{60}}\right]_{100}^{w} \\ &= e^{-\frac{100}{60}} \\ &\approx 0.1889 \end{aligned}$$

2. A manufacturing plant at EarthProducts produces environmentally-friendly bricks whose lengths are normally distributed with a mean of 8 inches and a standard deviation of 0.25 inches. In a shipment of 10,000 bricks from EarthProducts, about how many would you expect to find that are more than 8.5 inches long?

   (The formula for the normal distribution pdf is $\dfrac{1}{\sqrt{2\pi}\sigma}e^{\frac{-(x-\mu)^2}{2\sigma^2}}$.)

   Solution: The pdf is given by $\dfrac{1}{\sqrt{2\pi}\times 0.25}e^{\frac{-(x-8)^2}{2(0.25)^2}}$, and the probability that we're looking for is given by

$$\int_{8.5}^{\infty} \frac{1}{\sqrt{2\pi}\times 0.25} e^{\frac{-(x-8)^2}{2(0.25)^2}}\,dx$$

   The calculator says that this is approximately 0.0227501. In a shipment of 10000 bricks, we'd expect to find about 227 or 228 bricks that are more than 8.5 inches long.