Due at the start of class on Tues Sept 23, 2003.

Answer the following questions in groups of three. Turn in one solution sheet per group. Write the names of your group’s members at the top of the first page of your solution sheet.

You should attempt to complete the first two questions in 30 minutes.

1. An internationally famous spy, Jane Bond, has escaped from the headquarters of a diamond smuggling ring in the tiny Mediterranean country of Azusa. Bond, driving a stolen milk truck at 72 km/hr, has a 40-minute head start on her pursuers, who are chasing her in a Ferrari going 168 km/hr. The distance from the smugglers' headquarters in Azusa to freedom in the neighboring country of Duarte is 83.8 km. Does the spy live to return in Question 2 (or will it turn out that Question 2 is a trick question!)? Justify your answer.
2. [Page 90, #62] Having escaped from the smugglers, the spy receives an e-mail message saying that her best friend, Sigmund (“Siggy”) Leiter, has been found murdered, the body stuffed unceremoniously in a freezer. She remembers that $t$ hours after death, a body has temperature

$$T(t) = A + (B - A)e^{-0.03t},$$

where $A$ is the air temperature and $B$ is the temperature of the body at the time of death. The police inform the spy that at the time of discovery, 1:00 pm on Thursday, the corpse had temperature $40^\circ$ F, and the freezer $10^\circ$ F. The spy knows the deed was done by either Coldfinger or André Scélérat. If Coldfinger was in jail from Monday until Wednesday noon, and Scélérat was at a villains’ convention in Las Vegas from noon on Wednesday until Friday, who “iced” Siggy and when? (One of the few normal things about Siggy was his body temperature, $98.6^\circ$ F.) Justify your answer.
3. (Putnam Examination Problem) Evaluate

$$\lim_{x \to +\infty} \left[ \frac{1}{x} \cdot \frac{a^x - 1}{a - 1} \right]^{\frac{1}{2}},$$

where $a > 0$, $a \neq 1$. As usual, show all your work.