PHYS 5061 Homework 4.
Due: Monday, April 15.

(1) Bevington 2.3

(2) Bevington 2.9.

(3) Bevington 3.1, but do parts c and e only.

(4) Bevington 3.9

2.3. Evaluate the binomial distribution $P_B(x; n, p)$ for $n = 6$, $p = \frac{1}{2}$, and $x = 0$ to 6. Sketch the distribution and identify the mean and standard deviation. Repeat for $p = \frac{1}{6}$.

2.9. In a certain physics course, 7.3% of the students failed and 92.7% passed, averaged over many semesters.
  (a) What is the expected number of failures in a particular class of 32 students, drawn from the same population?
  (b) What is the probability that five or more students will fail?

3.1. Find the uncertainty σ_x in x as a function of the uncertainties σ_u and σ_v in u and v for the following functions:
  (a) $x = 1/2(u + v)$ (b) $x = 1/2(u - v)$ (c) $x = 1/u^2$
  (d) $x = uv^2$ (e) $x = u^2 + v^2$

3.9. Students in the undergraduate laboratory recorded the following counts in 1-min intervals from a radioactive source. The nominal mean decay rate from the source is 3.7 decays per minute.

Decays per minute	0	1	2	3	4	5	6	7	8	9	10
Frequency of occurrence	1	9	20	24	19	11	11	0	3	1	1

  (a) Find the mean decay rate and its standard deviation. Compare the standard deviation to the value expected from the Poisson distribution for the mean value that you obtained.
  (b) Plot a histogram of the data and show Poisson curves of both the parent and observed distributions.

In-class
Discussion

2.13. Members of a large collaboration that operated a giant proton-decay detector in a salt mine near Cleveland, Ohio, detected a burst of 8 neutrinos in their apparatus coincident with the optical observation of the explosion of the Supernova 1987A.
  (a) If the average number of neutrinos detected in the apparatus is 2 per day, what is the probability of detecting a fluctuation of 8 or more in one day?
  (b) In fact, the 8 neutrinos were all detected within a 10-min period. What is the probability of detecting a fluctuation of 8 or more neutrinos in a 10-min period if the average rate is 2 per 24 hours?