The following are sample problems for the final over probability and calculus. The final is "inclusive" and the other exam and sample problems should be reviewed (as well as homework and nearby exercises in the book).

1. Suppose P(A)=0.3, P(B)=0.7 and P(A∪B)=0.8.

   (a) Compute P(A∩B).
   (b) Are A and B independent events? Justify your answer.

2. Suppose the probability of a horse winning its first race is 0.05 and the probability of it winning its first two races is 0.02.

   (a) What is the probability of the horse winning its second race, given that it has won its first race?
   (b) If the events of winning the first and second races are independent, what is the probability of the horse winning its second race?

3. Suppose two factories make widgets. Factor A makes 350 widgets, of which 25 are defective. Factory B makes 275 widgets of which 15 are defective. Compute each of the following:

   (a) The probability that a randomly chosen widget is defective.
   (b) The probability that a randomly chosen widget is defective, given that it comes from factor B.
   (c) The probability that a radomly chosen widget was made in factor B, given that it was not defective.
   (d) The probability that a ramdomly chosen widget was made in factor A and was defective.

4. For the widgets and factories of the previous problem, are the events of "made in factory A" and "defective" independent? Justify your answer.

5. Explain why you might use basic techniques of differential calculus to predict tomorrow's weather from today's, but you would never try to use differential calculus to try to compute next month's weather from today's weather.

6. Find the equation of the tangent line to $y = x^2$ at $x = -2$. Sketch a graph of this situation.

7. For $f(x) = ax^2 + bx + c$ where a, b and c are constants,

   (a) Compute $f'(x)$.
   (b) Find the value of x for which $f'(x) = 0$.
   (c) Why does the value of x you just found correspond to the x value of the vertex of the quadratic?

8. Suppose the velocity of a car moving down a road is given by $v(t) = t^2$ for $0 < t < 3$. What is the total distance the car travels from time 0 to time 3?

9. A politician once claimed that "the rate of increase of government spending is decreasing". If we let $g(t)$ denote the government spending at time t, what does the statement above say about g in the language of calculus?

10. If the function $h(t)$ represents government deficit spending in year t, then what does

$$\int_{1990}^{2009} h(t)\, dt$$

represent?