

- c. (10) A wine maker believes that he can make a vintage wine if April rainfall is greater than 9.0 cm **and** September precipitation is less than 6.0 cm in the same year? What is the probability that this will occur in any year?

- d. (5) If the April precipitation is less than 1.5 cm, the crop is likely to fail. A wine maker can survive this once, but not two years in a row. What is the probability that April precipitation will be less than 1.5 cm two years in a row?

- 3. (40 Points)** When a structural design includes components that are welded together, it is necessary to inspect the welds to ensure that the structure will be sound.

A welding inspection device is 95% accurate when a good weld is tested, and 90% accurate when a bad weld is tested. In other words, if a weld is good, there is a 0.95 probability that it will pass the test. If a weld is bad, there is a 0.90 probability that it will fail the test. You may assume that the results of these inspection tests are independent.

- a. (10)** What is the probability that a bad weld passes the inspection test?
- b. (10)** A small bridge has eight (8) welds. If all eight are good welds, what is the probability that at least one of them will fail the inspection?

The local building code specifies the following procedure for certifying welds:

- If a weld passes the inspection test, it is *certified*.
- If a weld fails the inspection test, it is re-tested:
 - ⇒ If the weld passes the re-test, it is *certified*.
 - ⇒ If the weld fails the re-test, it is *rejected*.

c. (10) What is the probability that a good weld is rejected?

d. (10) What is the probability that a bad weld is certified?

Extra Credit (10 Points) The Monod equation is used to model the growth of bacteria in wastewater treatment plants:

$$\mu = \frac{Q_{\max} \cdot C_x}{K_M + C_x}$$

An experiment has been conducted, in which the growth rate (μ) has been measured for a series of substrate concentrations (C_x).

Show how the parameters Q_{\max} and K_M can be estimated from a linear plot derived from the measured μ and C_x values. What should be plotted on the x-axis? What should be plotted on the y-axis?