

MTH 362 FALL 2001

PRACTICE PROBLEMS FOR TEST 2

I Probability

1. A die is rolled 25 times. What is the probability of getting exactly two 6's?
2. 2 percent of the items produced by a machine are defective. What is the probability that when 50 items are produced, at most one item is defective? Solve first by using the binomial distribution model. Then solve the problem again to approximate the answer using the Poisson distribution model.
3. A random variable X is normally distributed with mean 4.0 and standard deviation 0.75. Use the table to find the following probabilities:
 - a) $P(X < 3)$,
 - b) $P(3 < X < 5)$,
 - c) $P(5 < X)$.
4. The length X of pipes produced by a machine is normally distributed with mean 60 in. and standard deviation 1.5 in. If a pipe is acceptable if its length is within 2 in. from the mean, what percent of the pipes produced by the machine is acceptable?

II First order differential equations

1. Solve the separable differential equations and the initial value problems.
 - (a) $y' + 3x^2y = 0$
 - (b) $e^x y' = 2(x+1)y^2$, $y(0) = \frac{1}{6}$
2. Solve the following linear differential equations and the Bernoulli equation.
 - (a) $y' + 2xy = 4x$
 - (b) $y' + 3y = \sin x$, $y(\pi/2) = 0.3$
 - (c) $y' + xy = xy^{-1}$
3. Use Picard iteration to approximate the solution of the initial value problem
$$\begin{cases} y' = y^2 \\ y(0) = 1 \end{cases}$$

III Second order homogeneous linear differential equations

1. Solve the linear differential equation
$$(1-x^2)y'' - 2xy' + 2y = 0$$
, given that $y_1 = x$ is a solution.
 1. Find a general solution.
 - (a) $y'' + 4y' - 21y = 0$
 - (b) $y'' + 4y' + 4y = 0$
 - (c) $y'' - 2y' + 2y = 0$
2. Solve the initial value problem
$$\begin{cases} y'' - y = 0 \\ y(0) = 3, \quad y'(0) = -3 \end{cases}$$