syms x K t n

% Given PDF

f\_x = K \* x \* (2 - x);

x\_min = 0;

x\_max = 2;

% 1. Solve for K using the normalization condition

eq = int(f\_x, x, x\_min, x\_max) == 1;

K\_sol = solve(eq, K);

f\_x = subs(f\_x, K, K\_sol); % Substitute K into f(x)

disp(['K = ', char(K\_sol)])

% 2. Compute the first four moments E[X^n]

moments = sym(zeros(1,4));

for i = 1:4

moments(i) = int(x^i \* f\_x, x, x\_min, x\_max);

fprintf('E[X^%d] = %s\n', i, char(vpa(moments(i), 6)))

end

% 3. Compute Moment Generating Function M\_X(t)

M\_X\_t = int(exp(t\*x) \* f\_x, x, x\_min, x\_max);

disp('Moment Generating Function:')

disp(simplify(M\_X\_t))