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% Computer Laboratory 4 - Extra Exercise
% This exercise is based on Example 3.4.2 from the course notes

fun = @(x) exp(x.^3);
true_value = integral(fun,0,1);

M = 1000; % I will make M estimates of the integral in question
estimates = zeros(M,1);
N = 100; % each MC estimator will be based on N uniform random numbers
for i = 1:M
    % each iteration of this for loop produces on estimate of the
 integral
    % in question
    sample = rand(N,1);
    estimates(i)=mean(fun(sample));
end
mu_hat = mean(estimates); % we will take this as our final MC estimate
sigma_hat = sqrt(var(estimates)); % estimated standard deviation of
 the MC
%estimator
text = 'The true value of the integral is %f.\n';
fprintf(text,true_value)
text = 'The Monte Carlo estimate of the integral is %f.\nThe estimated
 95 percent confidence interval for the MC estimator is (%f,%f).\n';
fprintf(text,mu_hat, mu_hat-1.96*sigma_hat, mu_hat+1.96*sigma_hat)
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The true value of the integral is 1.341904.
The Monte Carlo estimate of the integral is 1.343131.
The estimated 95 percent confidence interval for the MC estimator is
 (1.262089,1.424174).
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