Computational Physics: Problem Set 5

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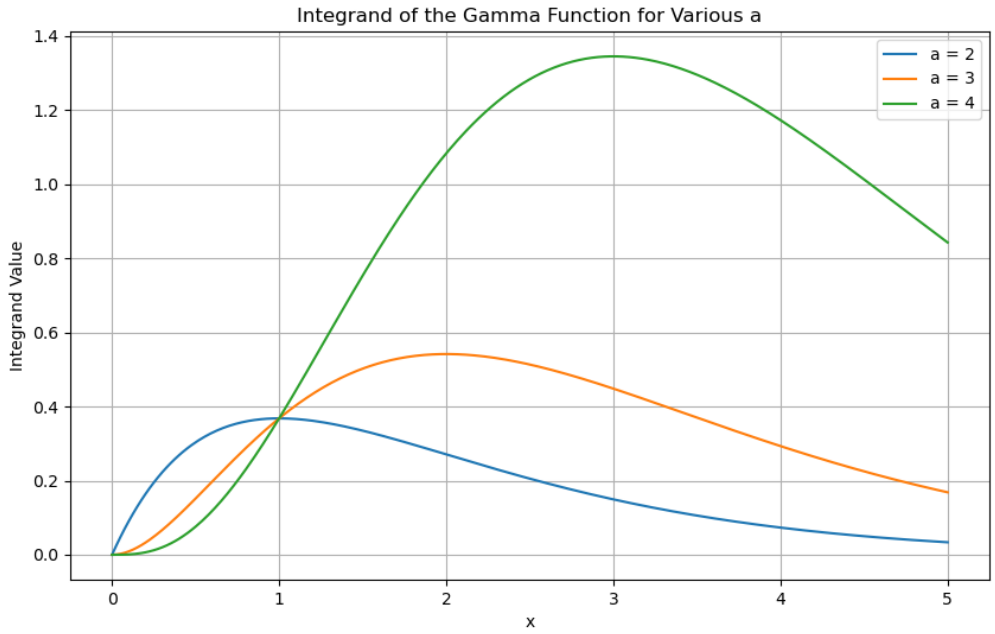
1 Questions

1.1 Question 1

The graph for part (a) shows the value of the integrand as a function of $x^{a-1}e^{-x}$ from 0 to 5, with three separate curves for a=2, 3, and 4. Each curve starts at zero, rises to a maximum, and then decays. The location of the maximum for each curve shifts to the right as a increases, consistent with the property of the gamma function integrand.

For part (b), set the derivative of the integrand to 0: $x^{a-2}(a-x-1)e^{-x}=0$. Only $(a-x-1)$ can be 0, so $x=a-1$ is a critical point where the maxima falls.



Using the formula $z = \frac{x}{c+x}$, we can convert the integrand to $x^{a-1}e^{-x} = e^{(a-1)ln(x)-x}$. Then, implement the gamma function, we get $\gamma(1.5) = 0.8862269254527004$, which matches the expected value. The calculated value of $\gamma(3)$ is approximately: 2.0 The calculated value of $\gamma(6)$ is approximately: 119.99999999999997 The calculated value of $\gamma(10)$ is approximately: 362880.0

These results all matches the expectation.

I had problem loading the data for question 2.