APPM 4650 Homework #3 Summer 2018

Due Wednesday, June 27, 2018

1. Use forward, central, or backward difference formulas (as appropriate) to determine each missing entry in the following table.

x	$f(x)$	$f'(x)$
0.5	0.4794	
0.6	0.5646	
0.7	0.6442	

2. Use Taylor series expansions to arrive at the expression

$$f'(x) \approx \frac{1}{h}\left(-\frac{3}{2}f(x) + 2f(x+h) - \frac{1}{2}f(x+2h)\right)$$

which we found in class using Lagrange polynomials.

3. Derive Simpson's $\frac{3}{8}$ Rule using

   (a) Lagrange polynomials.

   (b) Taylor comparison.

4. Approximate the value of $\displaystyle\int_0^2 x^2 e^{-x^2}\,dx$ using the following methods with $h = 0.25$.

   (a) Composite Trapezoidal rule.

   (b) Composite Simpsons's 1/3 rule.

5. Approximate the integral $\displaystyle\int_0^1 x^2 e^{-x}\,dx$ using Gaussian quadrature (to be covered next Monday) and compare your results to the exact values of the integral.

   (a) Use $n = 2$.

   (b) Use $n = 3$.