

Math 151a: HW #6, due on Wednesday, May 14

Reading: Section 4.1

[1] (a) Use the most accurate three-point formula to determine each missing entry in the following table:

x	$f(x)$	$f'(x)$
-0.3	-0.27652	
-0.2	-0.25074	
-0.1	-0.16134	
0	0	

(b) The data in the table was taken from the function $f(x) = e^{2x} - \cos 2x$. Compute the actual errors, and find error bounds using the error formulas.

[2] Let $f(x) = 3xe^x - \cos x$. Use the following data and the Second Derivative Midpoint Formula to approximate $f''(1.3)$ with $h = 0.1$ and with $h = 0.01$.

x	1.20	1.29	1.30	1.31	1.40
$f(x)$	11.59006	13.78176	14.04276	14.30741	16.86187

Compare your results to $f''(1.3)$.

[3] Derive an $O(h^4)$ five-point formula to approximate $f'(x_0)$ that uses $f(x_0 - h)$, $f(x_0)$, $f(x_0 + h)$, $f(x_0 + 2h)$, and $f(x_0 + 3h)$. [Hint: Consider the expression $Af(x_0 - h) + Bf(x_0 + h) + Cf(x_0 + 2h) + Df(x_0 + 3h)$. Expand in fourth Taylor polynomials, and choose A, B, C and D appropriately.]