

**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.]