



Philadelphia University
Department of Basic Sciences and Mathematics



Academic Year:	2016–2017	Course Name:	Numerical Analysis
Semester:	Second Semester	Course Number:	250371
Exam:	Second Exam	Instructor Name:	Feras Awad
Exam Date:	03/05/2017	Student Name:	_____
Exam Day:	Wednesday	University ID:	_____
Mark:	[20]	Serial:	_____

1. For a function $f(x)$, the Newton divided differences are given by

$x_0 = 0.0$	$f[x_0]$		
$x_1 = 0.4$	$f[x_1]$	$f[x_0, x_1]$	
$x_2 = 0.7$	$f[x_2] = 6$	$f[x_1, x_2] = 10$	$f[x_0, x_1, x_2] = \frac{50}{7}$

- (a) (1 point) Find the polynomial $p(x)$ that interpolates $f(x)$ at the nodes x_0 , x_1 , and x_2 .

- (b) (3 points) Determine the missing values in the table.

2. (4 points) Develop a formula for the first derivative $f'(x)$ in terms of $f(x-h)$, $f(x)$, and $f(x+2h)$. What is the **order of error** of this formula?

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing. There are no margins, text, or other markings on the page.

3. Consider the following table of values of a function $f(x)$.

x	1.0	1.2	1.4
$f(x)$	1.0000	1.2625	1.6595

(a) (1 point) Use the **forward-difference** formula to approximate the value of $f'(1.0)$.

(b) (1 point) Use the **central-difference** formula to approximate the value of $f'(1.2)$.

(c) (2 points) Approximate the value of $\int_{1.0}^{1.4} f(x) dx$ using the **mid-point** rule.

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This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, providing a template for writing or drawing. The margins are consistent on all sides.