

Name: _____

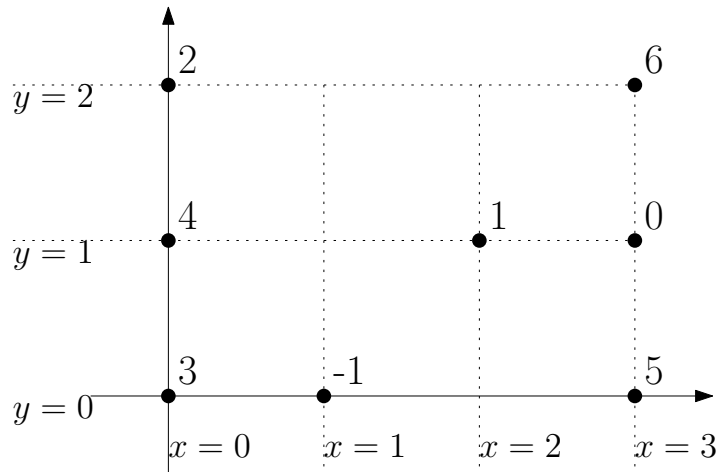
MATH 320: QUIZ 8

- (1) (3 points) We want to approximate the derivative of a function $f(x)$ using adjacent measurements $x_{i+1} = x_i + h$ and $x_{i-1} = x_i - h$
- (a) Find a formula for $f'(x_i)$ in terms of $f(x_{i+1})$ and $f(x_{i-1})$ so that the error is on the order of h^2 . (Hint: expand $f(x_{i+1})$ and $f(x_{i-1})$ as Taylor series to third order and cancel terms.)
 - (b) Find the h^2 term of the error.

(2) (3 points) Use the trapezoidal rule to approximate the double integral

$$\int_0^3 \int_0^2 f(x, y) \, dx \, dy$$

integrating first over x , then over y , using the values of f given in the Figure. Note that our data is unequally spaced.



- (3) (4 points) Write a MATLAB function that takes input **a**, **b** constants, and **f** a function, and gives as output an approximation

$$\int_a^b f(x)dx$$

using three-point Gauss Quadrature. Note that the evaluation points and weights are:

Evaluation points	$-\sqrt{3/5}$	0	$\sqrt{3/5}$
Weights	5/9	8/9	5/9