

MATH 209 QUIZ 3 - Version B

February 18, 2014

Name: ANSWERS

Instructions: Use your own scrap paper. Write your answers as decimals in the space provided. Do not show calculations on this page.

1. State the equation in theorem 3.2: $f(x+\Delta x) \approx f(x) + f'(x + \frac{\Delta x}{2}) \Delta x$

2. Consider the ODE $\frac{dy}{dx} = x^3 + 3 + e^y$, $y(0) = 0$. Theorem 3.1 was used to obtain $y(0.1) \approx 0.4$. Use this fact, and theorem 3.2 to approximate $y(0.2)$.

$y(0.2) \approx$ 0.899 (use three decimal places for the answer).

3. Consider the same ODE and initial condition from problem 2: $\frac{dy}{dx} = x^3 + 3 + e^y$, $y(0) = 0$. Use Euler's method with step size 2 to approximate $y(0.2)$. Fill out the table below with the appropriate numbers, rounding to three decimal places each step.

x	y	y'
0	0	4
0.1	0.4	4.493
0.2	0.849	XXXX

$\Rightarrow y(0.2) \approx$ 0.849

4. Repeat problem 3, but this time, use the *modified* Euler's method.

x	y	y'	$x_{1/2}$	$y_{1/2}$	$y'_{1/2}$
0	0	4	0.05	0.2	4.222
0.1	0.422	4.526	0.15	0.648	4.915
0.2	0.914	XXXX	XXXX	XXXX	XXXX

$\Rightarrow y(0.2) \approx$ 0.914

Bonus: Below, draw the *stability graph* for $\frac{dy}{dx} = y(y - 2)$, complete with stability arrows and smiley faces to show stability as done in class. Label the axes, steady states, and inflection points on the graph.

