Spring 2023

MATH7016 Ungraded Concept MCQ V

General Instructions: Read carefully. Open Book. Circle the one correct answer. No negative marking.

Name:

Circle your Group: A B C

1. Suppose you want to produce a table of t-values from $t = 0$ to (about) $t = 10$, in steps of $h = 0.1$. Which is *not* a suitable 'stopping rule':
   A. `while dblt < 10`
   B. `until dblt > 10`
   C. `until dblt = 10`
   D. `until abs(dblt-10)<0.1`

2. Which one of the following statements are *true*:
   A. We can analytically solve $\dfrac{dy}{dx} = \dfrac{\sin x}{x}$.
   B. Numerical Methods are more accurate than Analytical Methods (MATH7005 & MATH7006).
   C. Values of the exact solution of some initial value problems can be estimated with numerical methods with zero error.
   D. Sometimes an initial value problem does not have an exact solution.

3. Which one of the following statements are *true*:
   A. The local error in an approximation is the sum of the global errors.
   B. In general, increasing the step-size reduces the local and global errors.
   C. The global error in an approximation is the sum of the local errors.
   D. If the global error is zero the local errors are also zero.

4. Which of the below is equivalent to:
$$2\frac{d^2w}{dz^2} - 4w\frac{dw}{dz} - 8z^2w(z) = 0$$
   A.
$$\begin{cases} \dfrac{dw}{dz} = v \\ \dfrac{dv}{dz} = 2wz + 4z^2w \end{cases}$$
   B.
$$\begin{cases} \dfrac{dw}{dz} = w \\ \dfrac{dw}{dz} = -2wv - 4z^2w \end{cases}$$
   C.
$$\begin{cases} \dfrac{dw}{dz} = v \\ \dfrac{dv}{dz} = 2wv + 4z^2w \end{cases}$$
   D.
$$\begin{cases} \dfrac{dv}{dz} = w \\ \dfrac{dw}{dt} = 2wz + 4z^2w \end{cases}$$

5. Consider the initial value problem:

$$\frac{d^2y}{dx^2} = x^2 + y^2; \qquad y(0) = 1,\ y'(0) = 1.$$

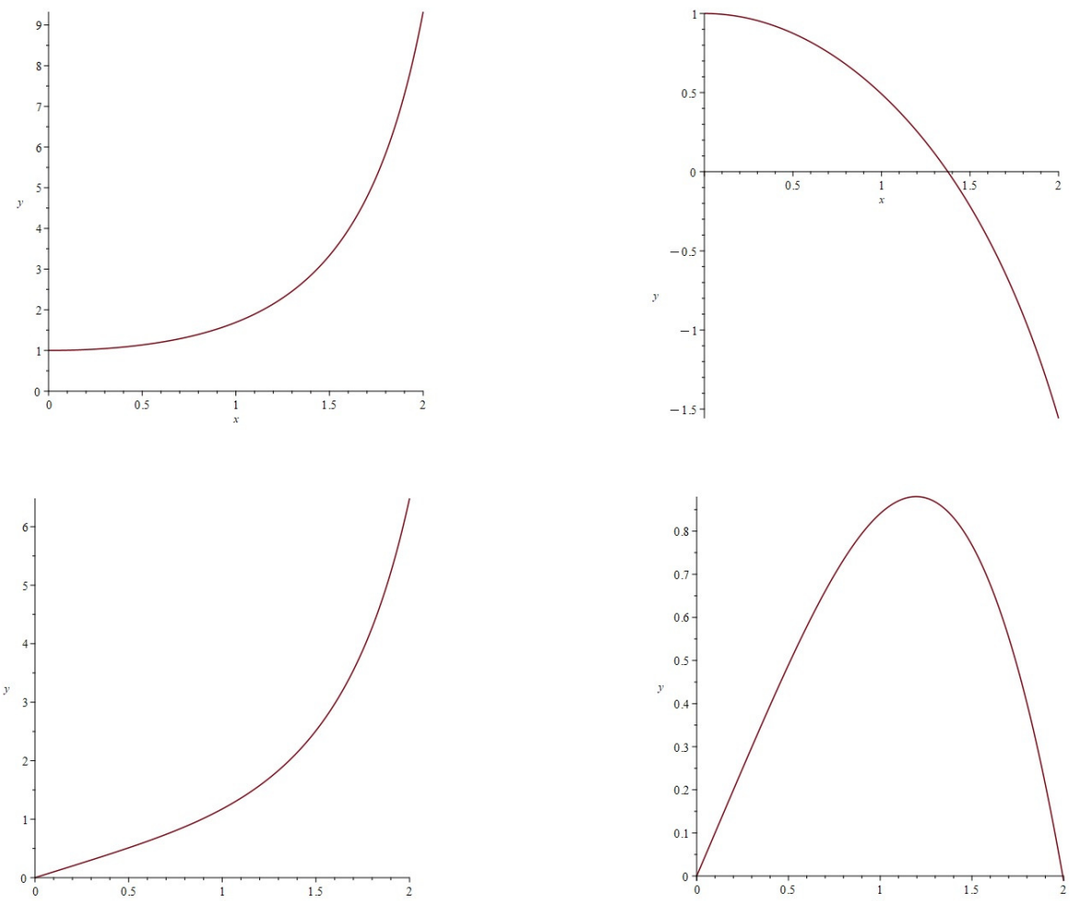

Figure 1: Circle the graph corresponding to the solution of the initial value problem.

6. For the initial value problem:

$$\frac{dy}{dx} = x^2 + y; \qquad y(1) = 2,$$

Which is correct:

A. $y''(0) = 0$

B. $y''(0) = 3$

C. $y''(0) = 5$

D. not enough information to say.