

1. Find the solution of the initial value problem $y' = 2y - 1$, $y(0) = 1$.
 $\phi(t) =$ _____

Find the approximate value of the solution of the initial value problem $y' = 2y - 1$, $y(0) = 1$, where $t = 0.4$ using:

- the Euler method (eul) with $h = 0.1$ _____
- the Euler method (eul) with $h = 0.05$ _____
- the Euler method (eul) with $h = 0.025$ _____
- the improved Euler method (rk2) with $h = 0.1$ _____
- the Runge–Kutta method (rk4) with $h = 0.1$ _____
- the solution $\phi(t)$ _____

2. Find the approximate value of the solution of the initial value problem $y' = \sqrt{t+y}$, $y(1) = 3$, where $t = 2$ using :

- the Euler method (eul) with $h = 0.025$ _____
- the Euler method (eul) with $h = 0.0125$ _____
- the improved Euler method (rk2) with $h = 0.1$ _____
- the improved Euler method (rk2) with $h = 0.05$ _____
- the Runge–Kutta method (rk4) with $h = 0.2$ _____
- the Runge–Kutta method (rk4) with $h = 0.1$ _____

3. Give reasons why the Euler tangent line method with $h = 0.1$ does not give a good approximation of the value of the solution of the initial value problem where $t = 1$.

(a) $y' = (y + 1.25)^2$, $y(0) = 0$,

solution $y = \frac{25t}{4(4 - 5t)}$.

(b) $y' = \frac{50t}{64(1 - 2y)}$, $y(0) = 0$,

solution $y = \frac{1 - \sqrt{1 - 25t^2/16}}{2}$.

(c) $y' = 2(ty)^{1/3}$, $y(0) = 0$,

solution $y = t^2$.

(d) $y' = 4e^{-t} - 3(1 - y)$, $y(0) = 0$,

solution $y = 1 - e^{-t}$.