Name: Solutions

Consider the following initial value problem.

$$\begin{cases} u' = -2u \\ u(0) = 1 \end{cases}$$

1. Approximate $u(1)$ using Euler's method with a step size $h = 0.25$.

$$U_0 = 1$$

$$U_1 = 1 + (0.25)(-2)$$
$$= 0.5$$

$$U_2 = 0.5 + (0.25)(-1)$$
$$= 0.25$$

$$U_3 = 0.25 + (0.25)(-0.5)$$
$$= 0.125$$

$$u(1) \approx U_4 = 0.125 + 0.25(-0.25) = 0.0625.$$

2. Is your approximate solution stable for the given step size? Explain.

Yes. The approximate solution is multiplied by 0.5 at each time step, so it will not grow without bound.