

Solutions to Quiz 2, Unit 2.5

Consider the following differential equation:

$$\frac{dX}{dt} = 2X . \quad (1)$$

Assume the initial value of X is 1; $X(0) = 1$. For this problem use $\Delta t = 0.1$.

1. What does Euler's method give for $X(0.1)$?

- A. 1.0
- B. 1.2
- C. 2.0
- D. 3.0

Solution: The answer is **B**. At $t = 0$, X is 1, so the derivative is:

$$\frac{dX}{dt} = 2(1) = 2 . \quad (2)$$

So, if X starts at 1, after 0.1 minutes X is:

$$X(0.1) = 1 + (2 \times 0.1) = 1.2 . \quad (3)$$

2. Using your answer to question 1, what does Euler's method give for $X(0.2)$?

- A. 1.20
- B. 1.40
- C. 1.44
- D. 1.50

Solution: The answer is **C**. At $t = 0.1$, X is 1.2, so the derivative is:

$$\frac{dX}{dt} = 2(1.2) = 2.4 . \quad (4)$$

We know that X is 1.2 at $t = 0.1$. So 0.1 minutes later:

$$X(0.2) = 1.2 + (2.4 \times 0.1) = 1.44 . \quad (5)$$