Interpreting a result in context

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Water enters at 2t+3 litres/minute for 0<=t<=4. Initially there are 10 litres. Find the final amount. [2 marks]

The added amount is $[t^2 + 3t]_0^4 = 28$.

Add the initial 10 litres.

Answer: 38 litres

2. Find the average temperature 20+2t degrees C over 0<=t<=4 hours. [2 marks]

Integrate to obtain 96 degree-hours.

Divide by the 4-hour interval.

Answer: 24 °C.

3. Velocity is v=t-2 m/s for 0<=t<=4. Find displacement and total distance. [2 marks]

The signed integral cancels.

Split at t=2 and integrate speed on each side.

Answer: Displacement 0 m; distance 4 m.

4. A population increases at 100 exp(0.1t) people/year for 0<=t<=10. Find the increase.
[2 marks]

An antiderivative is 1000 exp(0.1t).

Subtract its t=0 value from its t=10 value.

Answer: $1000(e-1)$ people, approximately 1718.

5. Marginal cost is 6q+10 dollars/unit. Find the cost increase when output rises from q=0 to 5.
[2 marks]

Integrate marginal cost over output.

$[3q^2+10q]_0^5=125$.

Answer: 125.

6. A solid has cross-section area pi(1+x) squared for 0<=x<=2 metres. Find its volume.
[2 marks]

Integrate pi times $(1+2x+x^2)$.

Evaluate to pi times $(2+4+8/3)$.

Answer: $26\pi/3$ m^3.