P1 **Concept:** Derivatives

Find: Take the derivatives of the following functions:

a) $i(t) = 3t^2 + 1$

b) $v(t) = 9\,t + 2e^{-6t}$

c) $q(t) = 2e^{-2t} \cdot 4e^{-3t}$ Simplify the result for full credit.

Hint: Part c) has a -40 in the answer

P2 **Concept:** Integrals

Find: Take the following integrals:

a) $W = \int_0^3 2t\,dt$

b) $w(t) = \int_0^t 2\tau\,d\tau$

c) $i(t) = 3\int_{-\infty}^t e^t\,dt$

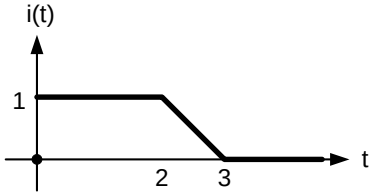
d) $q(t) = \int_{-\infty}^t i(\tau)d\tau$ for t ≥ 0 if $q(0) = 5$ and $i(\tau) = \begin{cases}\text{unknown}, & \tau < 0 \\ \frac{1}{2}\tau, & \tau \geq 0\end{cases}$

e) $q(t) = \frac{1}{2}\int_{\pi}^{2\pi} \sin\left(\frac{t}{2}\right) dt$

Hints:
- a) is a number, b) is a function of time
- c) does not require initial conditions, d) does
- The answer to d) has a ¼ in it, and the answer to e) is very simple

P3 **Concept:** Using calculus in EE

Find: $v(t) = \int_{-\infty}^t i(\tau)d\tau$ for t ≥ 0 if $i(t)$ is given below and $v(0)$ = - 4V:



Hints: The first time region (from 0 < t ≤ 2) answer has a -4 in it

The second time region (from 2 < t ≤ 3) answer has a $-\frac{1}{2}t^2$ in it