6. An object is moving along a line with its position given at time $t$ by $s(t) = 8t^2 - t^4$. Find the velocity and acceleration of the object as functions of $t$. Sketch a graph of $s$ from $t = 0$ to $t = 4$.

$$v(t) = s'(t) = 16t - 4t^3 = 4t(4-t^2)$$

$$a(t) = 16 - 12t^2$$

$v(t) = 0$ when $t = -2, 0, 2$.

We only need to consider those values that are greater than or equal to 0 and less than or equal to 4.

- $s(0) = 0$
- $s(2) = 32 - 16 = 16$
- $s(4) = 128 - 256 = -128$

\[ t = 0 \quad t = 4 \quad t = 2 \]

\[ -128 \quad 0 \quad 16 \]