(3.1)

Note: Do NOT use the Product Rule!!

10a) $s(t) = t^{\frac{5}{2}}(7-t)$

$= 7t^{\frac{5}{2}} - t^{\frac{7}{2}}$

$v(t) = \frac{35}{2}t^{\frac{3}{2}} - \frac{7}{2}t^{\frac{5}{2}}$

$a(t) = \frac{105}{4}t^{\frac{1}{2}} - \frac{35}{4}t^{\frac{3}{2}}$

10b) $v(t) = 0$

$\therefore \frac{35}{2}t^{\frac{3}{2}} - \frac{7}{2}t^{\frac{5}{2}} = 0$

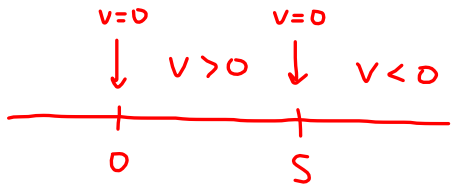
$\therefore \frac{7}{2}t^{\frac{3}{2}}\left[5 - t^{\frac{2}{2}}\right] = 0$

$\therefore \frac{7\sqrt{t^3}(5-t)}{2} = 0$

So $t = 0$ or 5

$\therefore$ the object stops after 5 seconds and then switches directions.

10c)



10e) $s(0) = 0 \longrightarrow$ IF $s(t) = 0$

$\therefore t^{\frac{5}{2}}(7-t) = 0$

$\therefore t = 0$ or 7

$\therefore$ the object returns to its original position after 7 seconds.

Q10d) Set $a(t) = 0$

Thus, $\frac{105\sqrt{t}}{4} - \frac{35\sqrt{t^3}}{4} = 0$

Method A

$$\frac{105\,t^{\frac{1}{2}}}{4} = \frac{35\,t^{\frac{3}{2}}}{4}$$

So, $t = 0$ OR $\frac{105(4)}{35(4)} = \frac{t^{\frac{3}{2}}}{t^{\frac{1}{2}}}$

$t = 3$

Method B

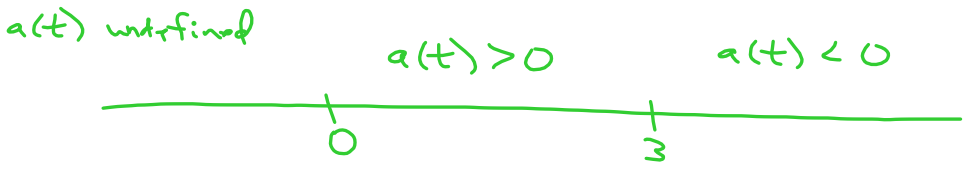
$$\frac{105\sqrt{t}}{4} - \frac{35\sqrt{t^3}}{4} = 0$$

$$105\sqrt{t} - 35\sqrt{t^3} = 0$$

$$35\sqrt{t}\left[3 - \sqrt{t^2}\right] = 0$$

$35\sqrt{t}(3-t) = 0$

$\therefore t = 0$ OR $t = 3$



Thus $a(t) > 0$ when $0 < t < 3$

(Q14) $s(t)=t^5-10t^2$, $v(t)=5t^4-20t$, $a(t)=20t^3-20$

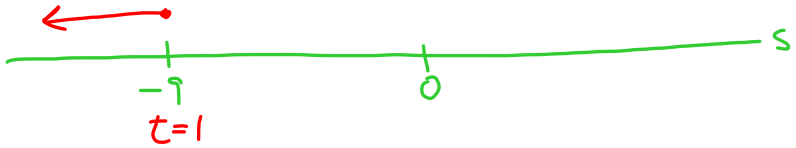
So, $a(t)=0$ when $20t^3=20$

$t^3=1$

$t=1$

Well, $s(1)=-9$, $\therefore$ object is "left" of origin

$v(1)=-15$, $\therefore$ object is moving "left"wards



So, when $t=1$, the acceleration is zero and the object is moving away from the origin.

(*) Note: You need $s(1)$ AND $v(1)$ to know whether or not the object is moving towards/away from the origin when $t=1$.