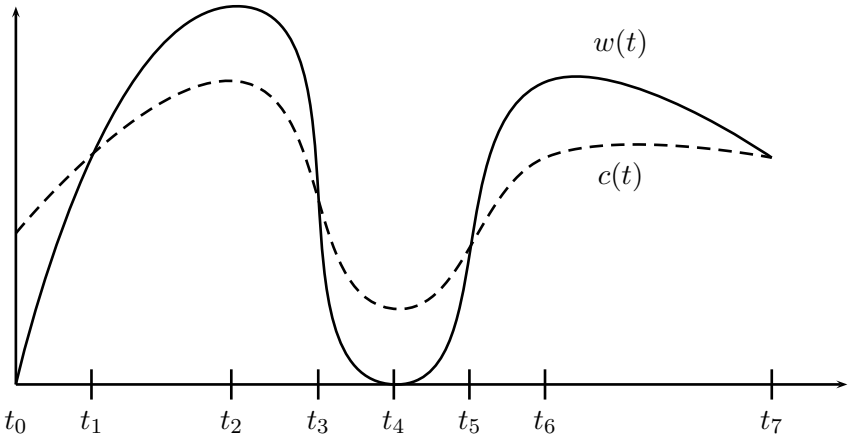
1. In the 17th century, a ship's navigator would estimate the distance the ship has traveled using readings of the ship's velocity, $v(t)$, in knots (nautical miles per hour). Suppose that between noon and 3:00 pm a certain galleon is traveling with the wind and against the ocean current, and that its velocity is given as the difference between the wind velocity $w(t)$ and the velocity of the ocean current $c(t)$, so that $v(t) = w(t) - c(t)$, where t is in hours since noon. Consider the wind and ocean velocities for various times between noon and 3:00 p.m., given by the graphs below:



(a) (1 point) Using *integral notation* write an expression giving the distance the ship traveled from noon to 3:00 pm. Give units.

(b) (1 point) Using *integral notation* write an expression giving the average velocity of the ship between noon and 3:00 pm. Give units.

(c) (2 points) For what intervals was the ship's velocity positive?

(d) (2 points) For what t values was the ship not moving towards its destination?

(e) (2 points) For what intervals was the ship's velocity increasing?

(f) (4 points) Please circle each integral which is positive and underline each integral which is negative.

$$\int_{t_1}^{t_3} v(t)dt \qquad \int_{t_5}^{t_7} v(t)dt \qquad \int_{t_0}^{t_7} w(t)dt \qquad \int_{t_3}^{t_5} c(t)dt$$