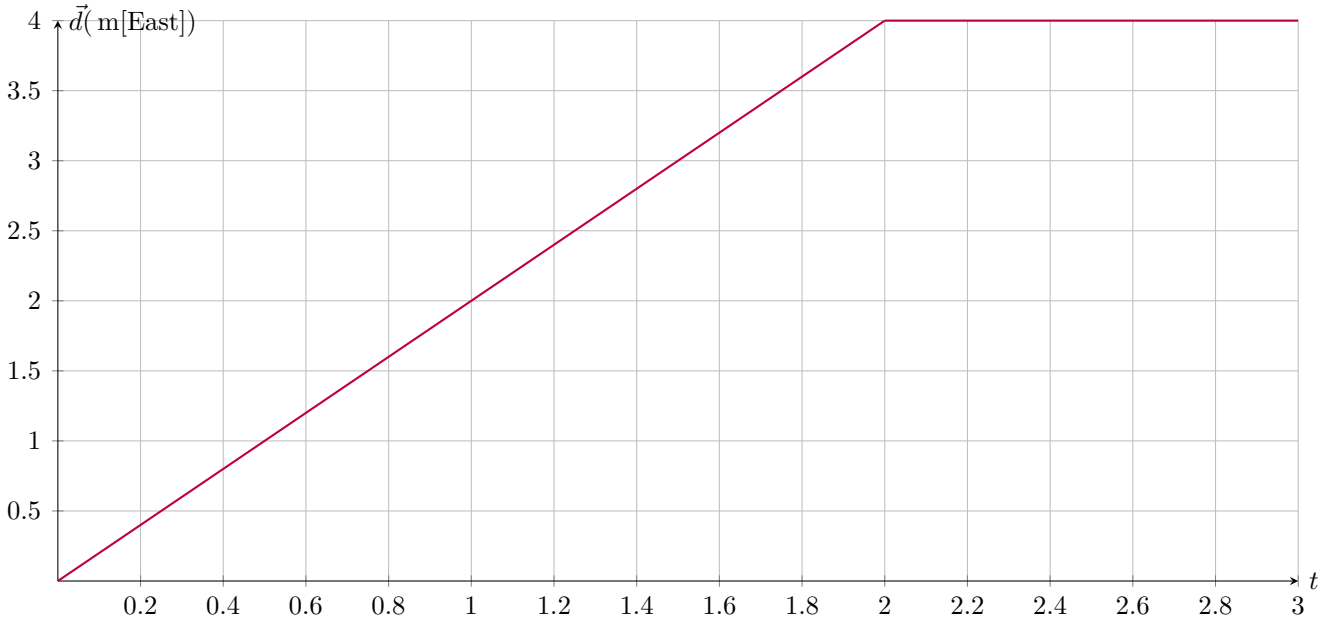
Question 1:

Answer the followiing True / False questions **(Assume [North],[East] is positive)**

1. I throw a rock $d = 100\,\text{m}$ in the air and it returns to my hand in $\Delta t = 20\,\text{s}$
   (a) The average speed of the ball was $v_{av} = 5\,\text{m/s}$. (T / F)
   (b) The average velocity of the ball over $\Delta t = 20\,\text{s}$ was $\vec{v}_{av} = +5\,\text{m/s[North]}$. (T / F)
2. Suppose a rubber bullet travels at an average speed of $v_{av} = 600\,\text{km/s}$ and an average velocity of $v_{av} = +600\,\text{km/s}$.
   (a) The distance it can cover in $\Delta t = 4\,\text{s}$ is $d = 2.4 \times 10^6\,\text{m}$. (T / F)
   (b) Suppose the reference point is $(0, 0)$. If the gun is placed at $\vec{d}_i = +20\,\text{m}$ and then fired, then after $\Delta t = 2\,\text{s}$, $\vec{d}_f = +1.2 \times 10^3\,\text{m}$. (T / F)
3. Suppose that the equation of motion for a rocket was $x = -4t - 6$. Then,
   (a) The rocket experienced uniform motion. (T / F)
   (b) The rocket experienced an average velocity of $\vec{v}_{av} = -10\,\text{m/s}$. (T / F)
   (c) The rocket was initially [West] relative to the reference point. (T / F)
4. Suppose that a frisbee has an average speed of v_{av} and that it takes Δt seconds to reach the end of the room.
   (a) Doubling the average speed of the frisbee will triple the distance it can travel. (T / F)
   (b) If I want the frisbee to reach the end of the room in $\frac{\Delta t}{3}$ seconds then I must triple the average speed. (T / F)
5. Consider the Position V. Time graph for a body in motion below



(a) The body had an average velocity of $\vec{v}_{av} = +2\,\mathrm{m/s}$. (T / F)

(b) The body continued to move in the positive direction after $t = 2\,\mathrm{s}$. (T / F)

6. On an island there are three points A, B, C that lie on a straight line. There is no information of $\vec{d}_{AB}$, I would like to obtain this vector. I can obtain this vector if there exists information of,

(a) $\vec{d}_{AC}$, $\vec{d}_{BC}$. (T / F)

(b) $\vec{d}_{CA}$, $\vec{d}_{CB}$. (T / F)

(c) $\vec{d}_{AC}$, $\vec{d}_{CB}$. (T / F)

(d) $\vec{d}_{BC}$, $\vec{d}_{CA}$. (T / F)

(e) The average speed and the time elapsed from A, B. (T / F)

Question 2:

Convert the following quantities to $\mathrm{m/s}$

(a) $120\,\mathrm{mi/h}$

(b) $400\,\mathrm{km/h}$

(c) $368\,\mathrm{m/min}$

(d) $678\,\mathrm{in/min}$

Question 3:

Compute the **displacement** (or net displacement) given the position vectors. Assume that the reference point is $(0, 0)$ for all vectors.

(a) $\vec{d_1} = 623\,\text{m[East]}$, $\vec{d_2} = 412\,\text{m[West]}$

(b) $\vec{d_1} = +123\,\text{km}$, $\vec{d_2} = -81\,\text{km}$, $\vec{d_3} = -121\,\text{km}$, $\vec{d_4} = +610\,\text{km}$, $\vec{d_5} = +42\,\text{km}$, $\vec{d_6} = -742\,\text{m}$.

(c) $\vec{d_i} = 3\,\text{m[East]}$, $\vec{d_f} = 4\,\text{m[South]}$

Question 4:

Determine the sum/difference of the following vectors **geometrically**. Use the $x-$dimensional coordinate system.

(a) $\vec{A} = +3$, $\vec{B} = -6$

$$\vec{A} + \vec{B}$$

(b) $\vec{A} = +4$, $\vec{B} = +8$, $\vec{C} = -20$, $\vec{D} = -12$

$$\vec{A} + \vec{B} - (\vec{C} - \vec{D})$$

(c) $\vec{A} = +2$, $\vec{B} = +18$, $\vec{C} = -12$, $\vec{D} = -8$, $\vec{E} = +7$

$$-\vec{A} + \vec{B} + \vec{C} - \vec{D} + \vec{E}$$

Question 5:

Suppose a train took the following route the other day to the following cities; Oshawa, Pickering, Markham, London (Starting at Oshawa). Given below are all of his position vectors along the trip (All relative to **Toronto**). Compute his average velocity as well as his average speed if the trip took 3 h.

- $\vec{d}_{OSH} = 380\,\text{km}[\text{West}]$
- $\vec{d}_{PKR} = 434\,\text{km}[\text{West}]$
- $\vec{d}_{MRK} = 540\,\text{km}[\text{East}]$
- $\vec{d}_{LND} = 712\,\text{km}[\text{West}]$

Question 6:

Suppose that we have a straight line with three lights A, B, C. Suppose that we have the relative position vectors of these lights, $\vec{d}_{AB} = 56\,\text{m[East]}$, $\vec{d}_{CB} = 36\,\text{m[West]}$. Suppose that starting at light A, I traveled to the following sequence of lights $\{A, C, B, A, B, C\}$. If the entire journey took $\Delta t = 5\,\text{m}$, compute my average velocity over the journey as well as my average speed. (In m/s)