18. We use Eq. 2-2 (average velocity) and Eq. 2-7 (average acceleration). Regarding our coordinate choices, the initial position of the man is taken as the origin and his direction of motion during $5\,\text{min} \leq t \leq 10\,\text{min}$ is taken to be the positive x direction. We also use the fact that $\Delta x = v\Delta t'$ when the velocity is constant during a time interval $\Delta t'$.

(a) Here, the entire interval considered is $\Delta t = 8 - 2 = 6$ min which is equivalent to 360 s, whereas the sub-interval in which he is *moving* is only $\Delta t' = 8 - 5 = 3$ min $= 180$ s. His position at $t = 2$ min is $x = 0$ and his position at $t = 8$ min is $x = v\Delta t' = (2.2)(180) = 396$ m. Therefore,

$$v_{\text{avg}} = \frac{396\,\text{m} - 0}{360\,\text{s}} = 1.10\ \text{m/s}\ .$$

(b) The man is at rest at $t = 2$ min and has velocity $v = +2.2$ m/s at $t = 8$ min. Thus, keeping the answer to 3 significant figures,

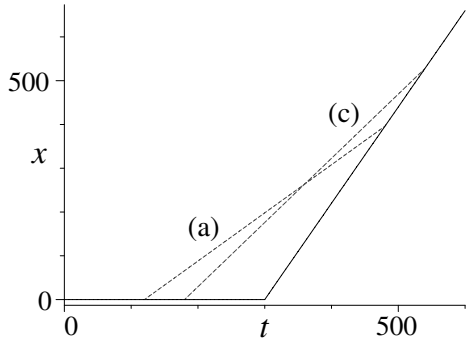
$$a_{\text{avg}} = \frac{2.2\,\text{m/s} - 0}{360\,\text{s}} = 0.00611\ \text{m/s}^2\ .$$

(c) Now, the entire interval considered is $\Delta t = 9 - 3 = 6$ min (360 s again), whereas the sub-interval in which he is moving is $\Delta t' = 9 - 5 = 4$ min $= 240$ s). His position at $t = 3$ min is $x = 0$ and his position at $t = 9$ min is $x = v\Delta t' = (2.2)(240) = 528$ m. Therefore,

$$v_{\text{avg}} = \frac{528\,\text{m} - 0}{360\,\text{s}} = 1.47\ \text{m/s}\ .$$

(d) The man is at rest at $t = 3$ min and has velocity $v = +2.2$ m/s at $t = 9$ min. Consequently, $a_{\text{avg}} = 2.2/360 = 0.00611\ \text{m/s}^2$ just as in part (b).

(e) The horizontal line near the bottom of this x-vs-t graph represents the man standing at $x = 0$ for $0 \leq t < 300$ s and the linearly rising line for $300 \leq t \leq 600$ s represents his constant-velocity motion. The dotted lines represent the answers to part (a) and (c) in the sense that their slopes yield those results.



The graph of v-vs-t is not shown here, but would consist of two horizontal "steps" (one at $v = 0$ for $0 \leq t < 300$ s and the next at $v = 2.2$ m/s for $300 \leq t \leq 600$ s). The indications of the average accelerations found in parts (b) and (d) would be dotted lines connected the "steps" at the appropriate t values (the slopes of the dotted lines representing the values of a_{avg}).