2023 AB #2
(calculator-active)

(a)

Stephen changes direction when $v(t) = 0$ and $v(t)$ changes signs.

When $0 < t < 90, v(t) = 0$ when $t = 56$ and $v(t)$ changes from positive to negative there.

Hence, Stephen changes direction when $\boxed{t = 56}$.

(b)

$a(60) = v'(60) = \boxed{-0.0360162389 \dfrac{m/\sec}{\sec}}$ or $-0.036 \dfrac{m/\sec}{\sec}$

$v(60) = -0.1595124013$

Stephen is $\boxed{\text{speeding up}}$ at $t = 60$ because his velocity and acceleration are both negative then.

(c)

The displacement or distance between the position at $t = 20$ and $t = 80$ is

$\int_{20}^{80} v(t)\,dt = \boxed{23.38399745m}$ or 23.383 or 23.384

(d)

The total distance traveled from $t = 0$ to $t = 90$ is

$\int_{0}^{90} |v(t)|\,dt = \boxed{62.16421624m}$ or 62.164