v(t)

v(t) > 0
v(t) < 0

A bug is crawling along a straight wire. The velocity, $v(t)$, of the bug at time $t$, $0 \leq t \leq 11$, is given in the graph above.

8. According to the graph, at what time $t$ does the bug change direction? → when velocity changes signs

   (A)  2
   (B)  5
   (C)  6
   (D)  8  b/c $v(t)$ changes from positive to negative @ $t = 8$
   (E)  10

9. According to the graph, at what time $t$ is the speed of the bug greatest? → speed $= |v(t)|$

   (A)  2    $|v(2)| = 3$
   (B)  5    $|v(5)| = 1$
   (C)  6    $|v(6)| = 2$
   (D)  8    $|v(8)| = 0$
   (E)  10   $|v(10)| = 4$ ← greatest speed

10. When does the particle move forward?  Particle moves forward on $(0,8)$ b/c $v(t) > 0$ on $(0,8)$
    $v(t) > 0$

11. When does the particle move backward?  Particle moves backward on $(8,11]$ b/c $v(t) < 0$ on $(8,11]$
    $v(t) < 0$

12. When is the particle's acceleration positive?  Particle's acceleration positive on
    $v(t)$ inc ← $v'(t) > 0$ ← $a(t) > 0$    $(0,2) \cup (5,6) \cup (10,11)$ b/c $v(t)$ inc on those intervals

13. When is the particle's acceleration negative?  Particle's acceleration is negative on
    $v(t)$ dec ← $v'(t) < 0$ ← $a(t) < 0$    $(2,3) \cup (4,5) \cup (7,10)$ b/c $v(t)$ dec on those intervals

14. When is the particle's acceleration zero?  Particle's acceleration is zero on $(3,4) \cup (6,7)$
    $v'(t) = 0$ ← $a(t) = 0$    b/c $v'(t) = 0$ on $(3,4) \cup (6,7)$

15. When does the particle speed up?  Particle speeds up on $(0,2) \cup (5,6) \cup (8,10)$ b/c
    $a(t)$ and $v(t)$
    Same signs    $v(t) > 0 + a(t) > 0$ and    $v(t) < 0 +$ on these intervals    $a(t) < 0$ on $(8,10)$

16. When does the particle slow down?  Particle slows down
    $a(t)$ and $v(t)$    on $(2,3) \cup (4,5) \cup (7,8) \cup (10,11)$ b/c
    different signs

17. When does the particle stand still?    $v(t) > 0$ and $a(t) < 0$ and    $v(t) < 0$ and $a(t) > 0$
    $v(t) = 0$    on these intervals    on $(10,11)$
    Particle stands still @ $t = 8$ b/c $v(8) = 0$