

2d. Exact answer is -48 ft/sec .

Can find excellent approximation by find average velocity on a very small interval near $T=6$.

Sign is negative means object was falling at that moment

2e. First find the moments in question.

Set $S=320$

Then

$$320 = -16T^2 + 144T$$

$$0 = -16T^2 + 144T - 320$$

$$0 = T^2 - 9T + 20$$

$$0 = (T-5)(T-4)$$

$$T=5 \text{ or } T=4$$

At $T=4$ the instantaneous velocity is exactly $+16 \text{ ft/sec}$

At $T=5$ the instantaneous velocity is exactly -16 ft/sec

In both cases, excellent approximations can be found by taking average velocity on a very small interval near the moment in question.