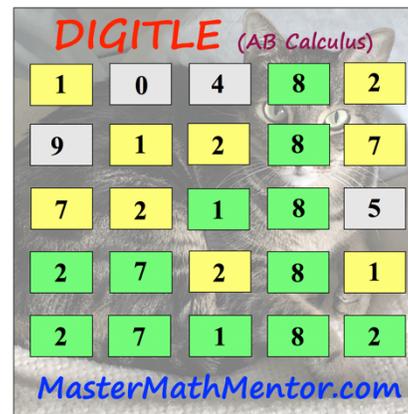# DIGITLE – AB CALCULUS
Puzzle 112 – Straight-Line Motion

Directions: The first 5 problems have single digit answers. The 6th problem has a 5-digit answer (counting leading zeros if present). You have a choice: solve the easier single-digit answer problems or tackle the more difficult 5-digit answer. Once you have done that, attempt to solve the puzzle by entering the following url on your computer, tablet, or phone: https://mastermathmentor.com/mmm/digitle.ashx.
The correct puzzle answer will be the digits of your answer(s) scrambled. Use the following interpretation. You get 6 tries.

Green : the digit is in the answer and is in the correct spot.   Grey :   the digit is not in the answer.
Yellow: the digit is in the answer but is not in the correct spot.

Single Digit Answers:

1) A particle moves along the *x*-axis such that at any time $t \geq 0$, its position function is given by $x(t) = -6t^3 + 51t^2 - 140t + 10$. For how many seconds is the particle moving right?

2) A particle is viewed traveling on a vertical line with velocity $v(t)$ as given in the figure to the right. Let *M* represent the number of intervals when the particle is moving up and slowing down and *N* be the number of intervals when the particle is moving down and speeding up. Find the positive difference between *M* and *N*.
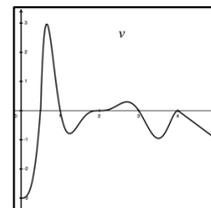
3) A particle moving along a straight line has position function $s(t) = e^{-t^2}$, $t \geq 0$. What is the acceleration of the particle to the nearest integer when $t = \sqrt{2}/2$?

4) Two particles, *m* and *n*, are moving along a straight line for $0 \leq t \leq 4$ with speeds as shown by the two graphs in the figure to the right. If *a* is the non-negative difference of particle velocities at any time, what is the largest possible value of *a* minus the smallest possible value of *a*.
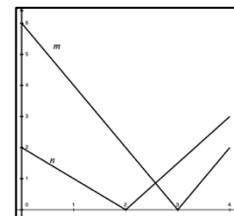
5) A turtle sets off on a long walk along a straight canal. The graph of its velocity $v(t)$ is shown on the graph to the right with *t* measured in days and *v* measured in miles per day. On what day did the turtle get the furthest from its starting point?
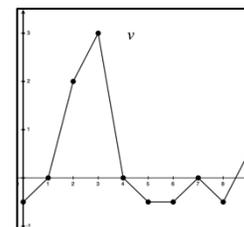
5-Digit Answer:

6) An extreme skydiver is going for a record. He jumps out of a plane and his vertical position is given by the equation $s(t) = 101169 - 190\left(t - \dfrac{0.85^t}{\ln 0.85}\right)$ where *t* is measured in seconds and $s(t)$ is measured in feet. To the nearest foot, how far will the skydiver have fallen when he is at 99.998% of terminal speed? (use at least 4 decimal place accuracy when you establish times).