

The Particle Problem

The velocity of a particle moving on the y-axis is given by  $v(t) = \frac{e^{t-2}}{2t^2+3} - 4$  on the interval  $[1, 11]$ . At time  $t = 1$ , the particle is 3 units above the origin.

(a) During what time interval is the particle moving down?

$$\frac{e^{t-2}}{2t^2+3} - 4 \leq 0$$

$(0, 8.34)$       Test point at 1 results to negative.

(b) What is the position of the particle when it is farthest south of the origin?

Minimum at  $t = 8.34$

$-20.7717$

$$\int \frac{e^{t-2}}{2t^2+3} - 4 dt + C$$

$s(t) =$

(c) At what time is the particle's average velocity twice the instantaneous velocity on the interval  $[2, 8]$ ?

$$\frac{1}{6} \int_2^8 v(t) dt = -3.281$$

$$2v = -3.281$$

$$v = -1.64$$

$t = 7.6449$

(d) Find the total distance traveled by the particle during the time where  $t \in [1, 11]$ .

$$\int_1^{11} |v(t)| dt$$

$= 49.302$