Let = the distance and . Hence, . Differentiating both sides yields: . Minimum distance occurs when . Hence, and . Thus, .

1. **55/16**

Hence,

Let

Hence,

. Thus,

Hence,

1. **3/2**

Set to see that . Take the derivative of both sides with respect to to find that . Thus,

1. **3**

 implies and due to symmetry. . Solving the second equation gives or . Plugging into the first equation gives . Hence,

1. **8**

Calculate the area under the graph of using geometry and add to to determine the values of . Therefore, and , which yields that

By the First Derivative Test, the minimum value will occur when . Using the shape of one can see that the minimum value will occur at .

Inflection points occur when is undefined and changes sign. This happens at . Thus, .

1. **11**

Rearranging the differential equation yields and integrating both sides yields: . Thus, . .

 Hence,

1. **15**

. .

 time when

Thus,

Note the line intersects the graph when . To find , solve the following equation: . Hence,

1. **15**

I is false. II is false since does not exist.

III is true by the Second Derivative test.

IV is false if and because then we have that .

V is true by the Mean Value Theorem. If , then that would imply the existence of a in the interval such that . However, we are told that .

 Thus, the sum of the values is .

1. **213**

Let . Then .

In addition, and .

Thus,

1. **78 miles per hour**

Let be the positions of cars and at time . Let the distance between them be . Hence, . Plugging in yields

1. **0**

For

Thus,

1. **2.53**

For , implicit differentiation yields . The tangent slope at is , implying the normal slope is . Using point-slope form, we find that . Thus,

For , .

Thus we have that