1 ->

a)

Here we have, y = 10t – 1.86t2

i -> [1, 2]

Average velocity =

=

=

=

= 4.42 m/s

ii -> [1, 1.5]

Average velocity =

=

= 5.35 m/s

iii -> [1, 1.1]

Average velocity =

=

= 6.095 m/s

iv -> [1, 1.01]

Average velocity =

=

= 6.2614 m/s

v -> [1, 1.001]

Average velocity =

=

= 6.22814 m/s

b -> Based on the calculations above we can calculate that the instantaneous velocity when t = 1 is 6.22 m/s.

A picture containing line, plot, diagram, slope

Description automatically generated

We can also use derivatives to calculate the velocity

= 10

= 10 (1) – 1.86(2t)

= 10 - 3.72t

When t = 1

We can say 10 – 3.72 \* 1 = 6.28 m/s

2 ->

a ->

Here we have the equation s =

i ->[1, 2]

Average velocity =

=

= 0.095765 cm/s

ii -> [1, 1.1]

Average velocity =

=

= 0.100015 cm/s

iii -> [1, 1.01]

Average velocity =

=

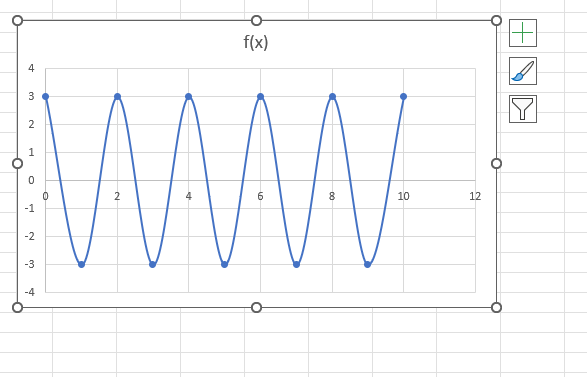
= 0.100435 cm/s

iv ->

Average velocity =

=

= 0.100477 cm/s



b)

we can find the instantaneous velocity by using derivative.

=

At t = 1, we have

=

= -2 cm/s

3 ->

A picture containing line, plot, parallel

Description automatically generated

It is somewhere around 0.32.

b ->

When x is very very close to zero the value is close to 0.31831.

A screenshot of a calculator

Description automatically generated with medium confidence

4 ->

Evaluating f(x) when x is close to 0 from left side.

When x = -0.1

We get = 2.867972

When x = -0.01

We get = 2.731999

When x = -0.001

We get = 2.719642

When x = -0.0001

We get = 2.718418

When x = -0.00001

We get = 2.718295

Evaluating f(x) when x is close to 0 from right side.

When x = 0.00001

We get = 2.718268

When x = 0.0001

We get = 2.718146

When x = 0.001

We get = 2.716924

When x = 0.01

We get = 2.704814

When x = 0.1

We get = 2.593742

Hence from these calculations we find that when x is getting closer and closer to 0 f(x) is getting closer to 2.7183. Yes, the value of these numbers is close to the value of the number e.

A picture containing line, plot, diagram, text

Description automatically generated

5 ->Below is the graph of the function f(x) = . Here when x =4 we get the value of to be 54.59815003 and the value of |4-4| is zero but the value of ln(0) is not defined. That is it is -infinity.

A graph on a graph

Description automatically generated with low confidence

We can write a piece wise function for this function we can say when x < 4 and x > 4 we can use = function but when x is 4 there is no value for it. So it is discontinuous function at f(4).

A picture containing line, plot, text, diagram

Description automatically generated

6 ->

Here we have,

= .

=

=

=

=

= 3 \* 2

= 6

When x is very close to 1 then the f(x) gets closer and closer to 6.

A picture containing text, number, screenshot, line

Description automatically generated

Here we can see that as x approaches 1 f(x) is closer and closer to 6.

|  |  |
| --- | --- |
| x | y |
| 0.9 | 5.280931738 |
| 0.99 | 5.925312187 |
| 0.999 | 5.992503125 |
| 0.9999 | 5.999250031 |
| 1.0001 | 6.000750031 |
| 1.001 | 6.007503125 |

A graph of a line

Description automatically generated with low confidence

b ->

5.5 <

We can see from the graph that when y is 5.5 x is close to 0.932 and when y is 6.5 x is close to 1.065.

So

The value of x must be between 0.932 and 1.065 in order for the function to be close by 0.5 of its limit value.