Calculus Videos

Calculus Videos Project

March 13, 2018

Contents

Part I

Approximating Instantaneous Rates of Change

Name

SAGE

```
nameCheck1 = function(a,b) {
  return a.toLowerCase() != b.toLowerCase();
};
  nameCheck2 = function(c,d) {
  return c.toLowerCase() != d.toLowerCase();
};
```

In the boxes below, please enter your first and last names. After you have typed it, press enter or click the question mark to submit your name.

Question 1 *First name:* □

Question 2 *Last name:* □

Question 3 *I agree to let the researchers use my data in the study (see details below)*

Multiple Choice:

(a) *yes* ✓

(b) *no* ✓

As part of your regular class activities, you will be watching several calculus videos and answering related questions. These videos and questions are part

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of a study that is investigating how students use and learn from calculus video lessons; the results of this study will be used to improve math videos and help students learn calculus more effectively. This web site will record your use of each video and your responses to the questions. If you consent (above), the researchers will be able to use your data in their study. Participating (or not) will have no impact on your course grade, your name will not be shared with other people, and you are able to withdraw from the study at any time. Please see the form linked here for full information.

Video Set Introduction

SAGE

```
nameCheck = function(a,b) {
  return a.toLowerCase() != b.toLowerCase();
};
```

Before watching the videos, think about and answer these questions to the best of your ability. Your answer will always be recorded as correct, regardless of your answer choice.

A car speeds up as it drives away from a traffic light. The cars GPS unit records its distance from the light in the table below:

Table 1: Time and Distance

Time (seconds)	Distance (meters)
0	0
1	1
2	3
3	6
4	10
5	15
6	21
7	27

Problem 1 *Compute an approximation of the cars speed at the 5-second mark.*

□.

Problem 2 *Is the value you computed:*

Multiple Choice:

(a) *Equal to the cars speed at the 5-second mark* ✓

(b) *An underestimate of the cars speed at the 5-second mark* ✓

(c) *An overestimate of the cars speed at the 5-second mark* ✓

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(d) *Neither an underestimate nor an overestimate* ✓

(e) *You cant tell without having more information* ✓

Problem 3 *How could you improve your approximation of the cars speed at the 5-second mark?*

Multiple Choice:

(a) *You dont need to make an improvement because the speed you calculated* is *the cars speed at the 5-second mark* ✓

(b) *Use a different pair of points from the table to compute the speed* ✓

(c) *Use two pairs of points from the table to compute two speeds, and then average these speeds* ✓

(d) *Use a larger interval of time (e.g., if you originally used a 1-second time interval, a 2-second time interval would improve your approximation)* ✓

(e) *Use a smaller interval of time (which would require additional information)* ✓

Problem 4 *The graph below represents the relationship between a cars distance in kilometers from an intersection (represented by $f(t)$) and the number of minutes elapsed since the car passed the intersection (represented by the variable t). Approximate the average rate of change of $f(t)$ with respect to t over the interval $[4, 6]$.*

[graph here]

Rate of change: $\boxed{5}$

Problem 5 *A car is driving away from a traffic light. The distance d (in feet) of the car from the traffic light t seconds since the car started moving is given by the formula $d = 1.3t^2 - 17$. Write an expression that represents the approximate the speed of the car 5 seconds after it started moving. $d(t) =$* $\boxed{5}$

Is the value of the expression you wrote in part an overestimate or underestimate of the cars actual speed 5 seconds after it started moving?

Multiple Choice:

(a) *overestimate* ✓

(b) *underestimate* ✓

Video 1

Approximating Instantaneous Speed

YouTube link: https://www.youtube.com/watch?v=sXEhePVRr34

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Video 2

Improving our Approximation of Instantaneous Speed

YouTube link: https://www.youtube.com/watch?v=jC9VKoaQ5HA

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Video 3

Approximating Instantaneous Fuel Economy

YouTube link: https://www.youtube.com/watch?v=GbApYWJm_rk

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Video 4

Improving our Approximation of Instantaneous Fuel Economy

YouTube link: https://www.youtube.com/watch?v=YLS0GSyHweU

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Post Video Questions

Please answer each of these questions to the best of your ability. You are welcome to re-watch parts of any of the videos to help you.

Problem 1 *A SUV monitors its fuel consumption as it starts to drive along a hilly highway. The SUVs internal computer records the level of fuel in its tank and its odometer readings periodically, shown in the table below:*

Fuel Level (gallons)	Distance (miles)
9.7	2
9.6	5
9.5	8
9.3	12
8.9	14
8.6	16
8.4	18
8.3	21

Compute an underestimate of the SUVs fuel economy when there are 8.9 gallons of fuel in its tank, assuming that the rate of fuel consumption is either constantly increasing or constantly decreasing. $\boxed{5}$ *miles per gallon*

Google Form link: https://docs.google.com/forms/d/e/1FAIpQLSfQJuDFKL_C1wBAzf76Xzv6ltbOAGW3Y7WeSxSFlaoEPZe6LA

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Instantaneous RoC Reflection

Please respond to the following questions.

Google Form link: https://docs.google.com/forms/d/e/1FAIpQLSffCRjlh5qVNQaZE1W2x9NBeuHjY4V1frOKmgpc3BQ

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