



- a.(5) By how much did the number of cars change between 7 am and 8 am?
- b.(5) How quickly (on average) did the number of cars on the street change between 2 pm and 4 pm? What are the units for your answer?
- c.(5) How quickly was the number of cars changing at 1 pm?
- d.(10) Is the rate of change of the number of cars positive, negative or zero at
- i) 9 am (Explain)
 - ii) 4 pm (Explain)

5.(5) Define the derivative of a function f at the point a : $f'(a)$.

1. Consider the function $f(x) = 3\sqrt{x}$.
- (10 points) Find the average rate of change of f between
 - $x = 3.5$ and $x = 4$
 - $x = 4$ and $x = 4.5$
 - (5) From looking at the graph of $f(x)$ tell why it is reasonable that the answer to (a.i) is larger than (a.ii).
 - (5) Approximate the instantaneous rate of change of f at $x = 4$. Be explicit about what you are calculating.
2. The average GPA for juniors at Clemson University is:

year	1983	1985	1987	1989
GPA	2.61	2.63	2.66	2.68

- (5) Look at the data and find a suitable linear or quadratic model. (You may wish to use the variable $t = \#$ years since 1983.)
- (5) Use your model to estimate the GPA in 1986. Comment on how appropriate it is to use the model for this calculation.
- (5) Use your model to estimate the GPA this year (1998). Comment on how appropriate it is to use the model for this calculation.
- (5) Think about how often grades are assigned and tell why it does not make sense to ask about the derivative of GPA as a function of time.

3. The other day after a hard rain there was a puddle of water on my driveway containing 10cc of water. It began to evaporate in the sun. After an hour there it contained only 8cc.

- (5) Assume the amount of water remaining is a linear function of time. Write an equation describing this.
- (5) When will half the puddle be gone?
- (5) What is the rate of change of the amount of water in the puddle after 2 hours? What are the units for this?
- (5) Assume the amount of water remaining is an exponential function of time. The model has the form $W = W_0 a^t$. What is W_0 ? Tell something about the value of a .
- (5) Using the exponential model, will the half life of the puddle be longer than 5 hours? Explain.
- (5) Choose one of the models and argue that it is better than the other. (Don't worry about the "right" answer. You will be graded on the mathematics in your argument, not on the choice of model.)

4. The following graph represents the number of cars on a certain stretch of road at time t from 6 am to 6 pm on a weekday. (For example, at 6 am, there are 11 cars on the road.)