

MAT265 HOMEWORK 02

Due Date: February 03, 2015

Name: _____

Instructions: The following exercises are similar to those found in the course text book [related text book question are in brackets]. Show ALL your work and write neatly. This assignment is due at the beginning of the class period on the date above. Group work is allowed and encouraged, but each member must write up his/her own solutions. Submissions without staples, without a name, or without work shown *will not receive credit*.

1. [§1.6, #34]
 a. Sketch a graph of the function

$$f(x) = \frac{\sqrt{x^2 + x + 2}}{5x - 1}$$

How many horizontal and vertical asymptotes do you observe? Use the graph to estimate the values of the limits

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + x + 2}}{5x - 1} \quad \text{and} \quad \lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 + x + 2}}{5x - 1}$$

- b. By calculating values of $f(x)$, give numerical estimates of the limits in part (a).
 c. Calculate the exact values of the limits in part (a). Did you get the same value or different values for these two limits? [In view of your answer you part (a), you might have to check your calculation for the second limit.]
2. [§1.6. #36] Find the horizontal and vertical asymptotes of the curve. Check your work by graphing the curve and estimating the asymptotes. $F(x) = \frac{x - 5}{\sqrt{x^2 - x + 4}}$

3. [§1.6, #38]
 a. Use a graph of

$$f(x) = \sqrt{2x^2 + 8x + 1} - \sqrt{2x^2 + x + 19}$$

to estimate the value of $\lim_{x \rightarrow \infty} f(x)$ to one decimal place.

- b. Use a table of values of $f(x)$ to estimate the limit to four decimal places.
 c. Find the exact value of the limit.
4. [§2.1, #14] The displacement (in meters) of a particle moving in a straight line is given by $s = \frac{1}{2}t^2 - 4t + 13$, where t is the time measured in seconds.

- a. Find the average velocity over each time interval:
- i. [3, 4] ii. [3.5, 4] iii. [4, 5] iv. [4, 4.5]

- b. Find the instantaneous velocity when $t = 4$.
5. [§2.1, #16] Find an equation of the tangent line to the graph of $y = g(x)$ at $x = 3$ if $g(3) = -5$ and $g'(3) = 3$.

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6. [§2.1, #32] The following limit represents the derivative of some function f at some number a . State such an f and a

$$\lim_{h \rightarrow 0} \frac{\sqrt[3]{27+h} - 3}{h}$$

7. [§2.1, #36] The following limit represents the derivative of some function f at some number a . State such an f and a .

$$\lim_{t \rightarrow 2} \frac{t^3 - t^2 - 4}{t - 2}$$

8. [§2.1, #40] The number N of Starbucks locations worldwide is given in the table.

Year	2011	2012	2013	2014	2015
N	17,003	18,066	19,767	21,366,	23,043

Information provided by <http://www.statista.com/>

- a. Find the average rate of growth
 - i. from 2011 to 2013
 - ii. from 2014 to 2015
 - iii. from 2013 to 2014
 In each case, include the units.
- b. Estimate the instantaneous rate of growth in 2014 by taking the average of two average rates of change. What are its units?
- c. Estimate the instantaneous rate of growth in 2014 by measuring the slope of a tangent.
- d. Estimate the instantaneous rate of growth in 2013 and compare it with the growth rate in 2014. What do you conclude?