

New York City College of Technology
MAT 1475 - Fall 2019
Review for Exam 3

NAME: _____

Instructions: The exam is on Monday, November 25. It covers Sections 6.7, 3.1, 3.2, 3.3, 3.4, 3.5, 4.2.

The exam questions are closely related to the homework and to the examples shown in class. Make sure you review your WeBWorK assignments.

For more practice you are strongly encouraged to do the suggested homework from the textbook.

OpenLab: Please register for the OpenLab if you don't have an OpenLab account yet: <https://openlab.citytech.cuny.edu/>

This is a very quick process once you know how to access your City Tech email.

Once you are registered please visit our class site and click "join" (below the picture):

<https://openlab.citytech.cuny.edu/groups/mat1475-calculus-i-fall-2019/>

(you need to login to OpenLab to be able to join).

Solutions to this review sheet and other important documents will be posted on this site.

1. Given $f(x) = x^4 - 4x^3 + 1$:
 - a) Find the intervals of increase or decrease. Show all your work.
 - b) Find local (relative) maxima and minima. Show all your work.
 - c) Find the intervals of concavity. Show all your work.
 - d) Find the points of inflection. Show all your work.
 - e) Find the y -intercept.
 - f) Use the information from a)–e) to sketch the graph. On your graph clearly label local maxima, local minima, inflection points, y -intercept.
 - g) Check your work with a graphing calculator.
2. Given $f(x) = x^3 - 3x^2 - 9x + 4$:
 - a) Find the intervals of increase or decrease. Show all your work.
 - b) Find local (relative) maxima and minima. Show all your work.
 - c) Find the intervals of concavity. Show all your work.
 - d) Find the points of inflection. Show all your work.
 - e) Find the y -intercept.
 - f) Use the information from a)–e) to sketch the graph. On your graph clearly label local maxima, local minima, inflection points, y -intercept.
 - g) Check your work with a graphing calculator.
3. Given $f(x) = \frac{3x^2}{9 - x^2}$:
 - a) Find the domain of f . Write your answer in interval notation.
 - b) Find the intercepts.
 - c) Find the asymptotes by calculating the appropriate limits. Show all your work.

- d) Find the intervals of increase or decrease. Show all your work.
- e) Find local maximum and local minimum. Show all your work.
- f) Use the information from a)–e) to sketch the graph. Clearly label intercepts, asymptotes, local maximum, local minimum.
- g) Check your work with a graphing calculator.
4. Given $f(x) = \frac{3x}{x^2 - 16}$:
- a) Find the intervals of increase or decrease. Show all your work.
- b) Find local maximum and local minimum. Show all your work.
- c) Check your work with a graphing calculator.
5. Given $f(x) = \ln(x^2 + 1)$, find the extreme values (absolute maximum and absolute minimum values) of f on the interval $[-1, 2]$. Give exact answers.
6. Given $f(x) = -4\sin(x)$, find the extreme values (absolute maximum and absolute minimum values) of f on the interval $[0, 2\pi/3]$. Give exact answers.
7. Find $\lim_{x \rightarrow 0} \frac{e^{-3x} - e^{-9x}}{12x}$.
8. Find $\lim_{x \rightarrow \pi} \frac{\cos x + 1}{5 \sin x}$.
9. Find $\lim_{x \rightarrow 0} \frac{1 - \cos(7x)}{x^2}$.
10. Find $\lim_{x \rightarrow \infty} \frac{x^4 + x^3 + 3}{x^2 - 5}$.
11. Find the critical numbers of $f(x) = x^2e^{-4x}$.
12. Check if the Mean Value Theorem can be applied to $f(x) = 2x^2 - 1$ on the interval $[3, 5]$. If so find a value c in $(3, 5)$ guaranteed by the Mean Value Theorem.
- Note:** Since there was no WeBWorK assignment on the Mean Value Theorem (Section 3.2), the Mean Value Theorem problem in Exam 3 will be a 5 point extra credit problem.
13. If a snowball melts so its surface area decreases at a rate of $1 \text{ cm}^2/\text{min}$, find the rate at which the diameter decreases when the diameter is 6 centimeters. (Hint: $A = 4\pi R^2$, where R is the radius).
14. The radius of a sphere increases at a rate of $3 \text{ in}/\text{sec}$. How fast is the volume increasing when the diameter is 24 inches? (Hint: $V = \frac{4}{3}\pi R^3$, where R is the radius).
- Note:** There will be one question on related rates in the test, similar to the examples given in class. Make sure you review all those problems, not only the 2 reviewed here.