Math 142: Calculus II

Midterm 1

March 1, 2018

NAME (please print legibly): ______________________________

Your University ID Number: ______________________________

Indicate the lecture time you are registered for with a check in the appropriate box:

Gafni	TR 9:40-10:55pm	
Gafni	TR 2:00-3:15pm	
Passant	TR 3:25-4:40pm	
Zeng	MW 09:00-10:15am	

- You have 75 minutes to work on this exam.
- You are responsible for checking that this exam has all 12 pages.
- No calculators, phones, electronic devices, books, notes are allowed during the exam.
- Show all work and justify all answers. $\boxed{\text{Box}}$ final answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.
- Numerical or algebraic simplifications of answers are not required, **except when specifically stated otherwise.**
- Please sign the pledge below.

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam, and that all work will be my own.

Signature: ______________________________

QUESTION	VALUE	SCORE
1	19	
2	16	
3	15	
4	10	
5	10	
6	15	
7	15	
TOTAL	100	

1. (19 points)

Consider the function $f(p) = \dfrac{1}{p^2 - 9}$ and its derivatives $f'(p) = \dfrac{-2p}{(p^2-9)^2}$, $f''(p) = \dfrac{6p^2+18}{(p^2-9)^3}$.

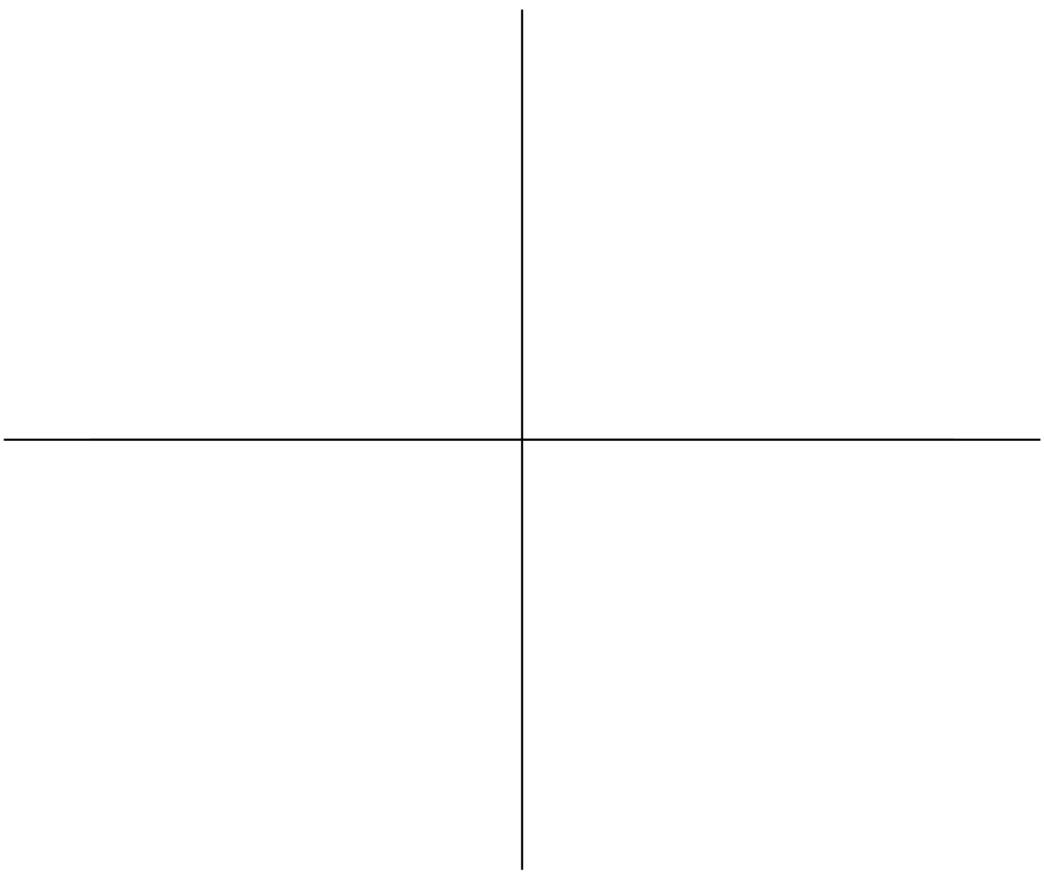
(a) Express the domain of $f(p)$ in interval notation.

(b) Find all values of p where vertical asymptotes exist. If none exist note this.

(c) Find the intervals where $f(p)$ is increasing. Give your answer in interval notation, if f is never increasing, then state this.

(d) Find any horizontal asymptotes of $f(p)$, if none exist note this.

(e) Use the above information to sketch the graph of $f(p)$ on the axis below.



2. (16 points) Indicate whether the following statements TRUE or FALSE. If the statement is FALSE please give a brief explanation of why. If the statement is TRUE please sketch a graph of a function (on your own set of axes) which has the desired property.

(a) A function can have three different vertical asymptotes.

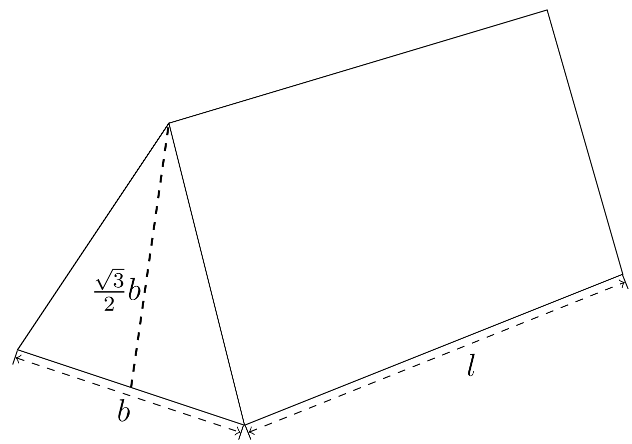
(b) A function can have three different horizontal asymptotes.

(c) A function can cross its own vertical asymptote.

(d) A function can cross its own horizontal asymptote.

3. (15 points) A Swiss sweet company has developed a new type of mint. After a meeting between the research department and the people from marketing, the shape decided for the new mint was triangular prism with ends forming equilateral triangles. Each mint has a volume of $\frac{27}{4}\text{cm}^3$. The company wishes to minimize the packaging needed to cover each mint.

Find the length b of the base of the triangle that will minimize the packaging needed to cover the mints.



4. (10 points)

(a) Estimate the definite integral $\int_0^1 \sqrt{1-x^2}\,dx$ by a Riemann sum using $n = 4$ rectangles and right endpoints as sample points. You don't need to simplify your answer; you may leave your answer as a sum of four terms.

(b) Evaluate $\int_0^1 \sqrt{1-x^2}\,dx$. Hint: Consider the shape of the region.

5. (10 points)

If $f(x) = \int_0^{\sin x} \sqrt{1+t^2}\, dt$ and $g(y) = \int_3^y f(x)\, dx$, find $g''(\pi)$.

6. (15 points) Evaluate the following integrals. Express each answer as a single fraction.

(a) $\displaystyle\int_{-1}^{2} (3u-2)(u+1)\,du$

(b) $\displaystyle\int_{1}^{4} \frac{2+x^2}{\sqrt{x}}\,dx$

(c) Remember that your answer should be a fraction (with no e or ln).

$$\int_0^{\sqrt{\ln 2}} xe^{x^2}\,dx$$

7. (15 points) Evaluate the following integrals.

(a) $\int \sec^2 x + 1\,dx$

(b) $\displaystyle\int \cot(x)\,dx$

(c) $\displaystyle\int \frac{1}{(2x+5)^3}\,dx$

Blank page for scratch work