

COURSE DETAILS:

Calculus I	MATH 111	MAJOR EXAM I
Semester:	Spring Semester --Term 172	
Date:	Sunday March 04, 2018	
Time Allowed:	90 minutes	

STUDENT DETAILS:

Student Name:			
Student ID Number:			
Section Number:		Serial Attendance Number:	
Instructor's Name:			

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Total	Total
Questions	1,2,3,4	5	6,7,8	9,10		
Marks						
	17	18	11	14	60	20

Q1. [3 points] Find the domain of the function: $f(x) = \frac{\sqrt{x^2 + 4} - \sqrt{1 - x}}{x}$ in the interval notation

Q2. [4 points] Let $f(x) = \frac{1}{1-x}$ and $g(x) = \sqrt{x}$ Find the domain of $f \circ g$.

Q3. [2+4=6 points] Let $f(x) = \frac{2x^2 + 2}{x^2 + x - 2}$ **(Show your work in details)**

a. Determine where is the function $f(x)$ continuous?

b. Find the horizontal and vertical asymptotes for the function $f(x)$.

Q4. [4 points] Sketch a graph of a function $f(x)$ that satisfies the following conditions:

- i. $f(x)$ is continuous at $x = 2$ but not differentiable at $x = 2$,
- ii. $f(x)$ has a vertical asymptote $x = -2$, and
- iii. $f(x)$ has a horizontal asymptote $y = 3$

Q5. [3+3+4+4+4=18 points] Evaluate the limit:

(Show your work in details)

a. $\lim_{x \rightarrow 6^+} \frac{-2x}{6-x}$

b. $\lim_{x \rightarrow 3^-} \frac{|x-3|}{3-|x|}$

c. $\lim_{x \rightarrow -2} \frac{x^3-4x}{x^2-x-6}$

d. $\lim_{x \rightarrow \infty} \frac{2x^3-2x^2+4x-1}{8-5x+3x^2-3x^3}$

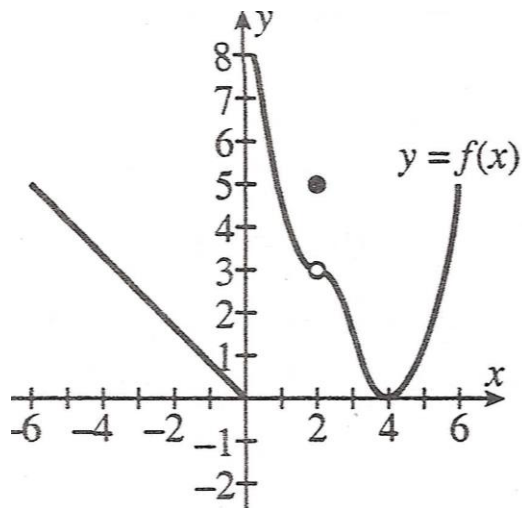
e. $\lim_{x \rightarrow \infty} [\ln(2x+5) - \ln(x-7)]$

Q6. [3 points] Use the Squeeze Theorem to find: $\lim_{x \rightarrow \infty} e^{-x^2} \sin(x^2)$

Q7. [4 points] Use the Intermediate Value Theorem to show that there is a root of the equation $x^2 - \cos(\pi x) = 4$ in the interval $(2, 3)$. (Show your work in details)

Q8. [4 points] Use the graph of the function $f(x)$

to find $\frac{f(4) + \lim_{x \rightarrow 2} f(x)}{1 + f(2)} =$



Q9. [4+3=7 points] Let $f(x) = \sqrt{5-3x}$ be given

(Show your work in details)

i. Use the definition of derivative to find $f'(a)$ for the function.

ii. Find the equation of the tangent line to curve $f(x)$ at $x = \frac{1}{3}$.

Q10. [7 points] Let f be the function defined by
$$f(x) = \begin{cases} ax+10 & \text{if } x \leq -2 \\ b|x| & \text{if } -2 < x \leq 2 \\ a(x-2)^2+6 & \text{if } x > 2 \end{cases}$$

Find the values of the constants a and b that makes continuous on $(-\infty, \infty)$