

Print Name _____

APPM 1350

Exam 1

Fall 2015

On the front of your bluebook, please write: a grading key, your name, student ID, your lecture number and instructor. This exam is worth 100 points and has 5 questions on both sides of this paper.

- Include this exam sheet in your bluebook. However, nothing on this exam sheet will be graded. Make sure all of your work is in your bluebook.
 - **Show all work and simplify your answers!** Answers with no justification will receive no points.
 - Please begin each problem on a new page.
 - No notes or papers, calculators, cell phones, or electronic devices are permitted.
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1. Consider the function $h(x) = \frac{4x}{\sqrt{x^2 - 25}}$

- (a) (4 points) Give the domain of this function in interval notation.
- (b) (6 points) Use the appropriate limits to identify any vertical asymptotes. If none exist, write “None” and explain why.
- (c) (6 points) Use the appropriate limits to identify any horizontal asymptotes. If none exist, write “None” and explain why.
- (d) (4 points) Is the function’s symmetry even, odd, or neither?

2. (21 points, 7 points each) Evaluate the following limits

(a) $\lim_{t \rightarrow 0} \left(\frac{3}{t} - \frac{3}{t^2 + t} \right)$

(b) $\lim_{x \rightarrow 0} \frac{|\sin x|}{\sin x}$

(c) $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta + \tan \theta}$

3. Consider the function $g(x) = \frac{\sqrt{x} - \sqrt{5}}{x^2 - 6x + 5}$.

- (a) (6 points) Give the domain of this function in interval notation.
- (b) (6 points) Evaluate $\lim_{x \rightarrow 5} g(x)$.
- (c) (8 points) The function g has a removable discontinuity at $x = a$. The discontinuity can be removed by creating a new function $h(x)$.

$$h(x) = \begin{cases} g(x) & x \neq a \\ b & x = a \end{cases}$$

Use the definition of continuity of a function to find the values of the constants a and b .

TURN OVER - Two more problems on the back!
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4. (15 points) Let $g(x) = \frac{x-1}{x+1}$.

- (a) Use the definition of derivative to find the slope of the tangent line to $y = g(x)$ at $x = 0$.
- (b) Find the equation of the tangent line to $y = g(x)$ at $x = 0$.
- (c) Find the equation of the normal line to $y = g(x)$ at $x = 0$.

5. (24 points, 6 points each) Some unrelated, short answer questions.

- (a) (HW 2.1.31) The limit $\lim_{h \rightarrow 0} \frac{(1+h)^{10} - 1}{h}$ represents the derivative of some function f at some number a .
 - (i) Find a function f and a value for a . (ii) What is the value of the limit?
- (b) Does $x + \tan x = 1$ have a solution? Justify your answer.
- (c) Sometimes a function f is not continuous on its domain but $|f|$ is continuous, on the same domain. Find an example of such a function f (i.e. f is not continuous at a point in its domain but $|f|$ is). Either sketch the graph of both $|f|$ and f or find a formula that illustrates this.
- (d) A factory manufactures metal cubes of volume $V = 8000 \text{ cm}^3$. An error tolerance of $\pm 5 \text{ cm}^3$ is allowed, which corresponds to a side length s between 19.996 and 20.004 cm. In terms of the formal definition of $\lim_{x \rightarrow a} f(x) = L$, identify x , a , $f(x)$, L , δ , and ϵ . No further explanation is necessary for this problem.