Math 108
Fall 2018
Dr. Lily Yen

Test 1

Show all your work

Name: _____

Score: ___/40

No Calculator allowed in this part.

Problem 1: Determine the following limits analytically showing all steps. Use the symbols DNE, ∞, and $-\infty$ where appropriate.

a. $\lim_{a\to-\infty} \dfrac{2+8a^2-3a}{7a-5-11a^2} =$

Score: /2

b. $\lim_{h\to 0} \dfrac{(x+h)^2-3-(x^2-3)}{h} =$

Score: /2

c. $\lim_{x\to -2^-} \dfrac{x^2-x-6}{x^2+4x+4} =$

Score: /2

d. $\lim_{x\to 9^+} \dfrac{\sqrt{x}+3}{9-x} =$

Score: /2

e. If $\lim_{x\to 5} f(x) = -2$ and $\lim_{x\to 5} g(x) = 3$, find $\lim_{x\to 5} \dfrac{4g(x)-1}{7+2f(x)} =$

Score: /2

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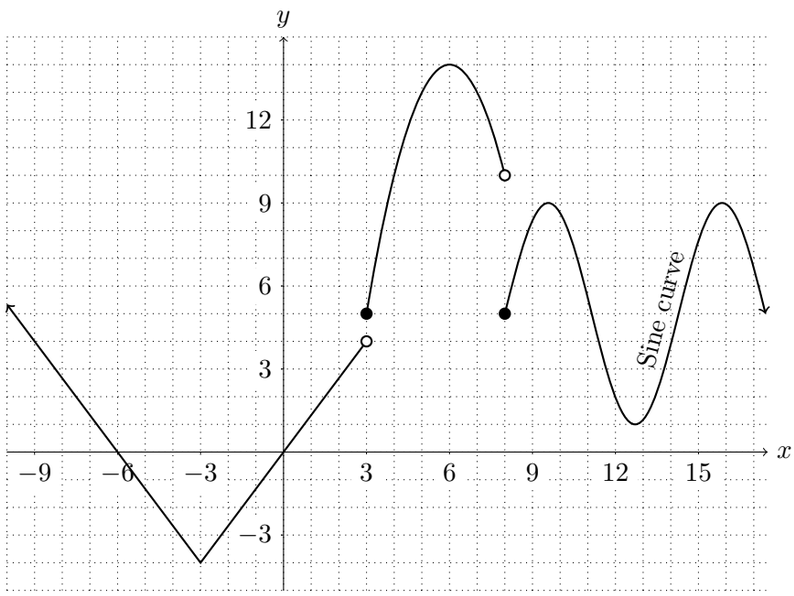
Calculators allowed from here on.

Problem 2: The graph of $y = f(x)$ is shown. Use the graph to answer the questions. Use the symbols DNE, ∞, and $-\infty$ where appropriate.



a. Express in as few intervals as possible the range of f.

b. Express in as few intervals as possible where f is continuous in $(-\infty, \infty)$.

c. $\lim_{x \to 3^-} f(x) =$

d. $\lim_{x \to 8} f(x) =$

e. $\lim_{x \to \infty} f(x) =$

f. $\lim_{h \to 0} \dfrac{f(e+h) - f(e)}{h} =$

g. $f'(-3) =$

h. $\lim_{x \to 6} \dfrac{f(x) - f(6)}{x - 6} =$

i. In the same grid above, graph $y = f'(x)$ for the interval $(-\infty, 8)$.

Score: /10

Problem 3: Use the definition of continuity to find a value k that makes the piece-wise defined function continuous everywhere.

$$f(x) = \begin{cases} 2x^2 + 5x + k, & x \leq -3 \\ kx, & x > -3 \end{cases}$$

Score: /4

Problem 4: Use correct notation, show all steps and leave your answer in simplified form.

a. Use the limit definition of the derivative to find the derivative of $f(x) = \sqrt{x} - 1$.

b. For the point $(4, 1)$, find an equation of the tangent line to f.

Score: /4

Problem 5: Assume that the equation $A(x) = -0.125x^2 + 2x + 1.125$ models attendance at Silver Star for Black Panther for the xth week ($A(x)$ in thousands of guests).

a. During which week will Black Panther attain its highest attendance at Silver Star?

b. Find the average rate of change in attendance over the first 3 weeks.

c. Estimate the instantaneous rate of change in attendance for the fifth week. Use the chart below to document your estimate from average rate of change (ARC) to its limiting value.

interval	ARC	interval	ARC

Score: /5

Problem 6: For Nikolaj's physics class, the height and arm span of each student was recorded. Below is the data set of eleven students.

Height (cm):	174	183	171	162	178	166	154	176	165	175	175
Arm span (cm):	148	162	158	162	135	156	154	162	145	169	151

Use the given data to answer the following questions:

a. Draw a scatter plot. Provide dimensions of the window and label your axes.

Score: /2

b. Use linear regression to find a model to fit your plot. Report your model to six decimal places.

Score: /2

c. According to your model, what is the arm span of a student with a height of 190 cm? Comment on the reliability of your answer.

Score: /1

d. According to your model, what is the predicted height for a student with an arm span of 160 cm? Comment on the reliability of your answer.

Score: /1

e. Comment on the reliability of your linear regression model relative to the scatter plot.

Score: /1