Math 131- Spring 2017- Exam 1

- 14 multiple choice questions worth 5 points each.
- 3 hand graded questions worth 10 points each.

- No notes allowed. You may use one of the approved non-graphing calculators.
- Multiple Choice: Mark your answer on the answer card in pencil.
- Written: To receive full credit, write up a clear, complete solution, showing all steps.

1. Let $f(x) = \sqrt{x^2 - 100}$. Find the domain of f.

   (a) $(-\infty, \infty)$

   (b) $[10, 10]$

   (c) $(10, 10)$

   (d) $(-\infty, -10] \cup [10, \infty)$

   (e) $(-\infty, -10) \cup (10, \infty)$

   (f) $(\infty, 0) \cup (0, \infty)$

   (g) none of the above

2. Let $f(x) = \sqrt{2x + 1}$ and $g(x) = \frac{1}{x^2 - 1}$. Find the domain of $(g \circ f)(x)$.

   (a) $(-\infty, \infty)$

   (b) $(-\infty, 0) \cup (0, \infty)$

   (c) $\left(-\frac{1}{2}, \infty\right)$

   (d) $\left[-\frac{1}{2}, \infty\right)$

   (e) $\left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, \frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$

   (f) $\left[-\frac{1}{2}, 0\right) \cup (0, \infty)$

   (g) none of the above

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3. By the laws of logarithms,

$$3 \log(x + 4) - 2 \log(y - 1) + \frac{1}{2} \log z = \log A$$

where A is which of the following?

(a) $\frac{(x+4)^3}{(y-1)^2 \sqrt{z}}$

(b) $\frac{(x+4)^3 \sqrt{z}}{(y-1)^2}$

(c) $\frac{(x+4)^3}{(y-1)^2 + \sqrt{z}}$

(d) $\frac{(x+4)^3 - \sqrt{z}}{(y-1)^2}$

(e) None of the above

4. Suppose that for x in the interval $[0, 4]$ we know that $4x - 4 \leq f(x) \leq x^2$. Find $\lim\limits_{x \to 2} f(x)$.

(a) -2

(b) -1

(c) 0

(d) 1

(e) 2

(f) 3

(g) 4

(h) Does not exist

(i) Not enough information is given to determine the value of the limit

5. Let

$$f(x) = \begin{cases} ax + 1 & x \le 1 \\ 4 - ax^2 & 1 < x. \end{cases}$$

For what value of a will the function be continuous everywhere?

(a) $-\frac{1}{2}$

(b) 0

(c) $\frac{1}{2}$

(d) 1

(e) $\frac{3}{2}$

(f) 2

(g) $\frac{5}{2}$

(h) 3

(i) 4

(j) more than one of the above a values will make f continuous

(k) none of the above

6. Find the limit:

$$\lim_{x \to 8} \frac{x^2 - 8x}{x^2 - x - 56}.$$

(a) 0

(b) 1

(c) $\frac{1}{2}$

(d) $\frac{3}{8}$

(e) $\frac{8}{3}$

(f) $\frac{8}{15}$

(g) $\frac{1}{7}$

(h) 8

(i) does not exist

(j) none of the above

(k) Find the limit:

7. Find the limit:

$$\lim_{t \to 0} \frac{\sqrt{100 - t^2} - 10}{t^2}.$$

(a) $-\frac{1}{20}$

(b) 0

(c) $\frac{1}{20}$

(d) 1

(e) $-\frac{1}{10}$

(f) 2

(g) $\frac{1}{10}$

(h) 3

(i) does not exist

(j) none of the above

8. Which of the following statements are correct?

I $\frac{x^2 + x - 6}{x - 2} = x + 3$

II $\lim_{x \to 2} \frac{x^2 + x - 6}{x - 2} = \lim_{x \to 2} x + 3$

(a) Both I and II are correct

(b) Both I and II are incorrect

(c) I is correct while II is incorrect

(d) I is incorrect while II is correct

(e) None of the above

9. Find the limit:

$$\lim_{p \to 1} p^4 - 2p^3 + 3p^2 - 4p + 2.$$

   (a) -3
   (b) -2
   (c) -1
   (d) 0
   (e) 1
   (f) 2
   (g) 3
   (h) 42
   (i) None of the above

10. Find the limit:

$$\lim_{y \to 3+} \frac{2 - x}{x - 3}.$$

   (a) $\frac{2}{3}$
   (b) $-\frac{2}{3}$
   (c) 0
   (d) $-\infty$
   (e) ∞
   (f) None of the above

11. Find the limit:

$$\lim_{x \to \infty} \frac{3x^5 + 4x^2 + 5}{7x^5 + 12x^2 - 2x}.$$

(a) 0

(b) $\frac{3}{7}$

(c) $\frac{7}{3}$

(d) $-\frac{3}{7}$

(e) $-\frac{7}{3}$

(f) $-\infty$

(g) ∞

(h) None of the above

12. The distance an object falls (in meters) when dropped from a tall building is given by the function

$$s(t) = 4.9t^2$$

where t is the time in seconds after the release. Find the instantaneous velocity (in m/s) three seconds after the object begins to fall.

(a) 20.0

(b) 24.5

(c) 29.4

(d) 34.3

(e) 49.0

(f) None of the above

13. Find the limit:

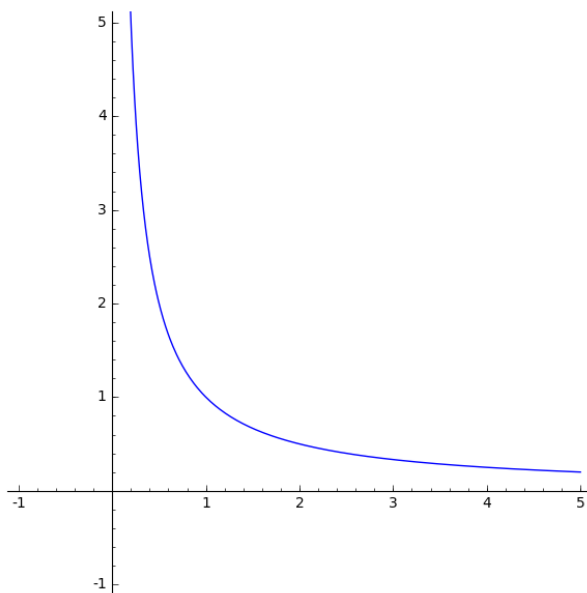$$\lim_{x \to 2^+} \ln(x - 2).$$

(a) -2

(b) 0

(c) 1

(d) 2

(e) $-\infty$

(f) ∞

(g) None of the above

14. Calculate $f'(a)$ for $f(x) = \frac{1}{x}$ and $a = 2$, then sketch a tangent on the graph of f to check your answer. (The sketch will not be graded, but if it does not match your calculation, find the mistake!)

(a) -4

(b) -1

(c) $-\frac{1}{4}$

(d) 0

(e) $\frac{1}{4}$

(f) 1

(g) 4

(h) None of the above

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Written Problem. Clearly show all steps to receive full credit.

15. Let $f(x) = \dfrac{\sqrt{16x^2 + 10}}{2x - 8}$
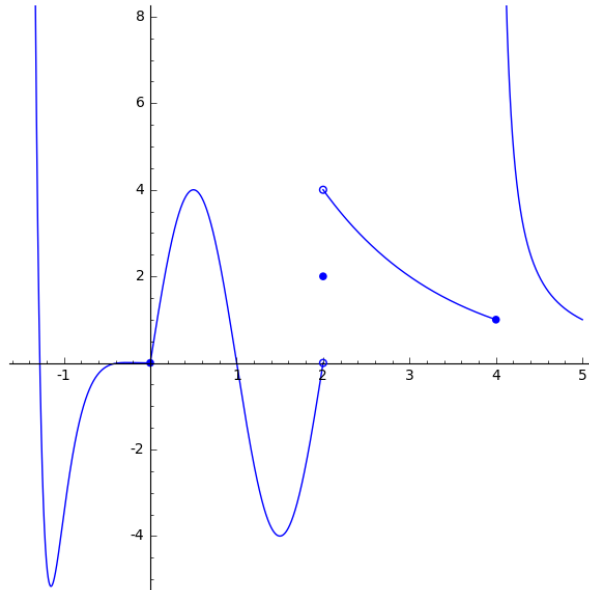
    (a) Find $\lim\limits_{x \to \infty} f(x)$.

    (b) Find $\lim\limits_{x \to -\infty} f(x)$.

    (c) List all of the horizontal asymptotes.

    (d) List all of the vertical asymptotes.

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Written Problem. Clearly show all steps to receive full credit.

16. Use the given graph of $f(x)$ to find the requested limit or function value.

(a) $\lim\limits_{x \to 0^-} f(x) =$ _____

(b) $\lim\limits_{x \to 0^+} f(x) =$ _____

(c) $\lim\limits_{x \to 0} f(x) =$ _____

(d) $\lim\limits_{x \to 2^-} f(x) =$ _____

(e) $\lim\limits_{x \to 2^+} f(x) =$ _____

(f) $\lim\limits_{x \to 2} f(x) =$ _____

(g) $\lim\limits_{x \to 4^-} f(x) =$ _____

(h) $\lim\limits_{x \to 4^+} f(x) =$ _____

(i) $f(2) =$ _____

(j) $f(4) =$ _____

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Written Problem. Clearly show all steps to receive full credit.

17. For each function below, find $f'(a)$, the derivative of the given function at the number a.

    (a) $f(x) = 3x^2 - x + 2$

    (b) $f(x) = \sqrt{4x + 1}$