

Name:

Exam 1 — Math 50 — Spring 2010

Write the best answer to each question in the box provided. For multiple choice and true/false questions, put your answer in the blank next to the question number.

No calculators. No notes.

1. _____ (4 pts) What is $\lim_{x \rightarrow 3} x^2 - 2x + 1$?
(a) 0
(b) 1
(c) 2
(d) 3
(e) 4
(f) 5
(g) None of the above
2. _____ (4 pts) If $\lim_{x \rightarrow 0^-} f(x) = 3$, $\lim_{x \rightarrow 0^+} f(x) = 3$, and $f(0) = 2$, then what is $\lim_{x \rightarrow 0} f(x)$?
(a) 0
(b) 2
(c) 3
(d) Does not exist.
(e) There is not enough information to give an answer.
3. _____ (4 pts) If $\lim_{x \rightarrow c} f(x) = 0$ and $\lim_{x \rightarrow c} g(x) = 0$, then $\lim_{x \rightarrow c} \frac{f(x)}{g(x)} =$
(a) 0
(b) 1
(c) ∞
(d) $\frac{0}{0}$
(e) Does not exist.
(f) There is not enough information to give an answer.

4. Calculate the limits. If the limit does not exist, but is ∞ or $-\infty$, write " ∞ " or " $-\infty$ " as your answer, respectively; otherwise, write "DNE" for "does not exist". (4pts each)

(a) $\lim_{x \rightarrow 3} \frac{2x - 5}{x + 3}$

(b) $\lim_{x \rightarrow 0} x \csc x$

(c) $\lim_{x \rightarrow 1} \frac{x}{\sin\left(\frac{\pi}{2}x\right)}$

(d) $\lim_{x \rightarrow 4} \begin{cases} (x - 5)^3 & x \geq 4 \\ x + 7 & x < 4 \end{cases}$

(e) $\lim_{x \rightarrow 2^+} \sqrt{x^2 - 4}$

$$(f) \lim_{x \rightarrow 0^+} \frac{\ln(3x)}{x}$$

$$(g) \lim_{x \rightarrow 0} \frac{\sin^2 3x}{2x^2}$$

$$(h) \lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x}$$

$$(i) \lim_{x \rightarrow 0} \frac{\tan(3x)}{x^2}$$

$$(j) \lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$$

5. (8 pts) Sketch a graph with the following characteristics. On the graph, label each discontinuity with its type (i.e., removable, jump, or infinite).

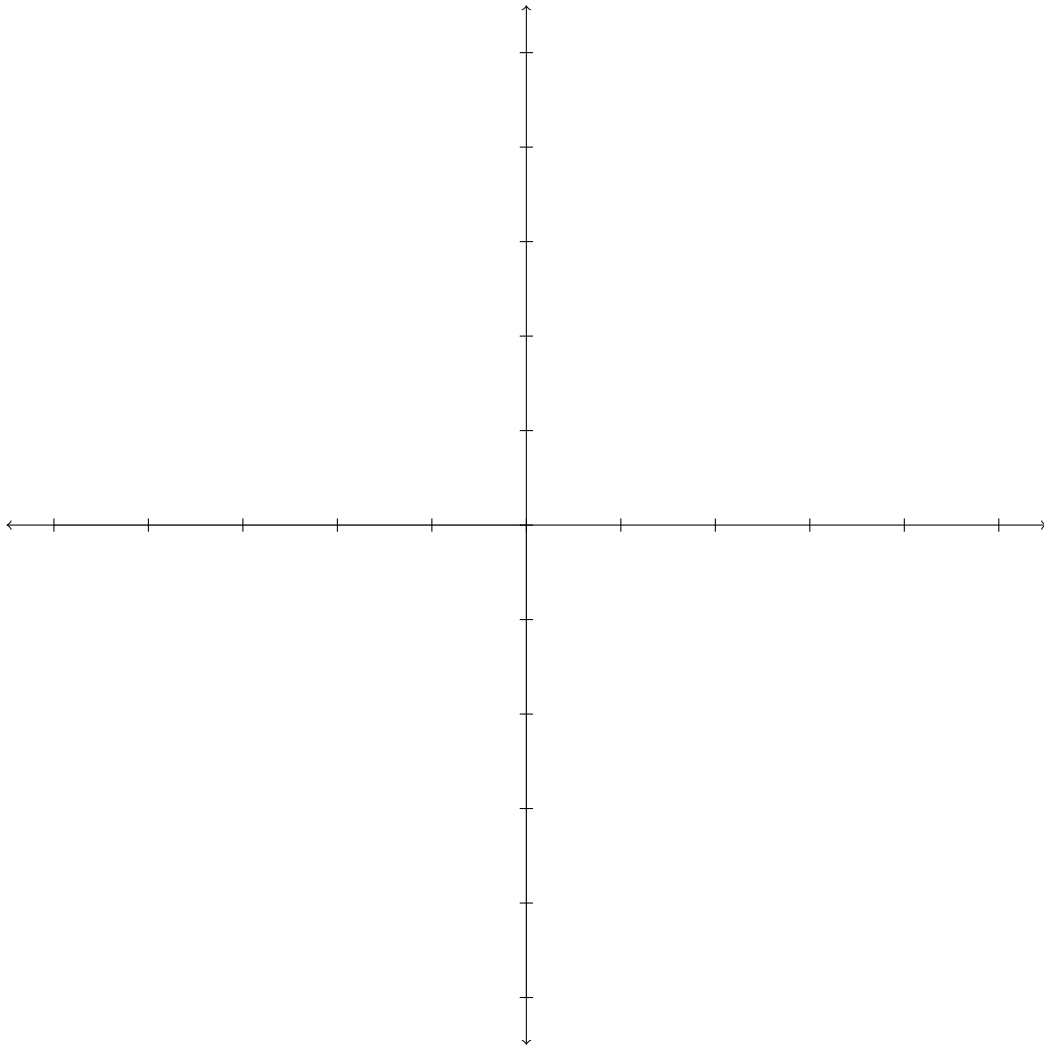
(a) $f(0)$ is undefined

(b) $\lim_{x \rightarrow 0^+} f(x) = 3$

(c) $\lim_{x \rightarrow 0^-} f(x) = 2$

(d) $\lim_{x \rightarrow 1} f(x) = \infty$

(e) f has a removable discontinuity at $x = -1$



6. Let $f(x) = x^2 \sin\left(\frac{1}{x}\right)$.

(a) (2pts) What is $f(0)$?

(b) (4pts) What is $\lim_{x \rightarrow 0} f(x)$? Explain your answer.

(c) (2pts) Is $f(x)$ continuous at $x = 0$?

7. (4pts) State the definition of what it means for a function $f(x)$ to be continuous at a point $x = c$.

8. Let $f(x) = \frac{(x+1)^2(2x)}{(x+2)(x)(x-1)}$.

(a) (12 pts) Calculate the limits. If the limit does not exist, but is ∞ or $-\infty$, write that as your answer; otherwise, write "DNE" for "does not exist". (1pt each)

i. $\lim_{x \rightarrow -2^-} f(x) =$

iv. $\lim_{x \rightarrow 0^+} f(x) =$

ii. $\lim_{x \rightarrow -2^+} f(x) =$

v. $\lim_{x \rightarrow 1^-} f(x) =$

iii. $\lim_{x \rightarrow 0^-} f(x) =$

vi. $\lim_{x \rightarrow 1^+} f(x) =$

(b) (6 pts) For what values of x is $f(x)$ discontinuous? Label each discontinuity with its type (removable, jump, or infinite).

(c) (4 pts) Give a rough sketch of $f(x)$. Label any vertical asymptotes.

