Math 75A Practice Midterm II
Ch. 4, 5, 15 (Ebersole), 1.6-2.6 (Stewart)

DISCLAIMER. This collection of practice problems is *not* guaranteed to be identical, in length or content, to the actual exam. You may expect to see problems on the test that are not exactly like problems you have seen before.

On the actual exam you will see directions similar to these:

1. Please read directions carefully. Raise your hand if you are not sure what a problem is asking.
2. *You must explain your work thoroughly and unambiguously to receive full credit on questions or parts of questions designated as* ***Work and Answer****.*
3. **No calculators or notes are allowed on this exam.**
4. You have 65 minutes to complete your test, unless announced otherwise. Do not spend too long on any one problem. You do not have to do the problems in order. Do the easy ones first. Do not attempt the bonus question until you have completed the rest of the test. Before turning in your test, please make sure you have answered and double-checked all the questions.
5. If you need scratch paper, please raise your hand. You may not use your own paper. When you have finished your exam, please turn in any scratch paper you use.
6. Write your solutions in the space provided for each problem, or provide specific instructions as to where your work is to be found. *Make it clear what you want and don't want graded.* Your final answers should be boxed or circled.
7. Don't stress! I'm rooting for you!

Multiple Choice. *Circle the letter of the best answer.*

1. The inverse of the function $f(x) = 3x^4 + 1$ is

(a) $f^{-1}(x) = \sqrt[4]{\dfrac{x-1}{3}}$

(b) $f^{-1}(x) = \sqrt[4]{\dfrac{x}{3}} - 1$

(c) $f^{-1}(x) = \sqrt[4]{\dfrac{x}{3} - 1}$

(d) none of these; $f(x)$ does not have an inverse

2. If $\ln(3x-2) = 4$, then $x =$

(a) $\dfrac{e^4+2}{3}$

(b) $\dfrac{\ln 4 + 2}{3}$

(c) $\dfrac{4+\ln 2}{\ln 3}$

(d) $e^{4/3} + 2$

3. If the distance of a train from a station at time t minutes is $s(t) = 30 - t^2$ meters, then the average velocity of the train during the second minute is

(a) 6 meters per minute
(b) 3 meters per minute
(c) 4 meters per minute
(d) 26 meters per minute

4. The slope of the tangent line to the graph of $f(x) = |x+2|$ at $x = -3$ is

(a) 1
(b) -1
(c) 0
(d) undefined.

5. $\underline{\underline{\text{At } x = 1}}$ the graph of $f(x) = \dfrac{x-1}{x^2 - 4x + 3}$

(a) is continuous
(b) has a hole
(c) has a vertical asymptote
(d) has none of the above

6. $\underline{\underline{\text{At } x = 3}}$ the graph of $f(x) = \dfrac{x-1}{x^2 - 4x + 3}$

(a) is continuous
(b) has a hole
(c) has a vertical asymptote
(d) has none of the above

7. $\underline{\underline{\text{At } x = -2}}$ the graph of $f(x) = \dfrac{|x+2|}{x+2}$

(a) is a horizontal line at $y = 1$
(b) has a hole
(c) has a vertical asymptote
(d) has none of the above

8. $\underline{\underline{\text{At } x = -1}}$ the graph of $f(x) = \dfrac{|x+2|}{x+2}$

(a) is a horizontal line at $y = 1$
(b) has a hole
(c) has a vertical asymptote
(d) has none of the above

9. For $f(x) = 4x^5 - \pi x^3 + \dfrac{x}{\sqrt{6}}$ and $g(x) = 5x^3 - \dfrac{4}{x} + 2$, which are polynomial functions?

(a) $f(x)$ only
(b) $g(x)$ only
(c) both $f(x)$ and $g(x)$
(d) neither $f(x)$ nor $g(x)$

10. The zeros of the function $f(t) = 5t^2 + 13t - 6$ are

(a) 5 and 13
(b) $\frac{2}{5}$ and -3
(c) -2 and $\frac{3}{2}$
(d) $\frac{1}{2}$ and -6

11. The function $s(t) = \dfrac{t^2 - 9}{t + 3}$

(a) is continuous at $t = -3$
(b) is not continuous at $t = -3$.

12. Suppose $f(x)$ is a function such that $\lim_{x\to 1} f(x) = 2$. Which of the following is *always* true of $f(x)$?

(a) $f(x)$ is continuous at $x = 1$
(b) $f(1) = 2$
(c) $f(x)$ is continuous on the intervals $(0, 1)$ and $(1, 2)$
(d) None of these.

13. $\displaystyle\lim_{x\to\infty} \frac{3x^4 - 4x^2 + 2x - 1}{5 - x^4} =$

(a) $\frac{3}{5}$
(b) -3
(c) ∞
(d) 0

14. If $x < 0$, then $\sqrt[6]{\dfrac{1}{x^{18}}} =$

(a) $\dfrac{1}{x^3}$
(b) $-\dfrac{1}{x^3}$
(c) $\dfrac{1}{x^{1/3}}$
(d) $-\dfrac{1}{x^{1/3}}$

Fill-In.

1. $\log_2\left(\dfrac{1}{32}\right) =$ _______

2. $\log(100) =$ _______

3. $e^{4\ln 10} =$ _______

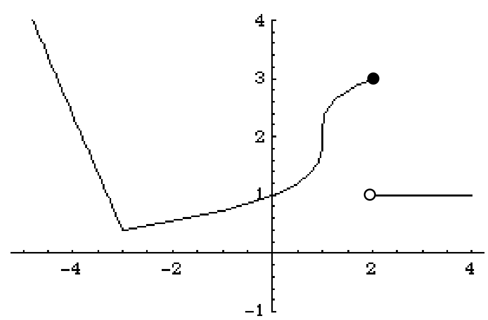
4. $\displaystyle\lim_{x\to -1^+} \frac{x-5}{x+1} =$ _______

5. $\displaystyle\lim_{x\to 7} \frac{x-5}{x^2 - 12x + 35} =$ _______

6. $\displaystyle\lim_{x\to -\infty} \frac{3x^6 - 4x^5 + x^2 + 3x}{\sqrt{5}x^4 - x^3 - 1} =$ _______

7. $\displaystyle\lim_{x\to\infty} \frac{2x+3}{4x^3 - x + 8} =$ _______

8. Use the graph of $g(t)$ shown at right to answer parts (a) and (b). For each question, list **all** the t-values or largest intervals that make the sentence true.



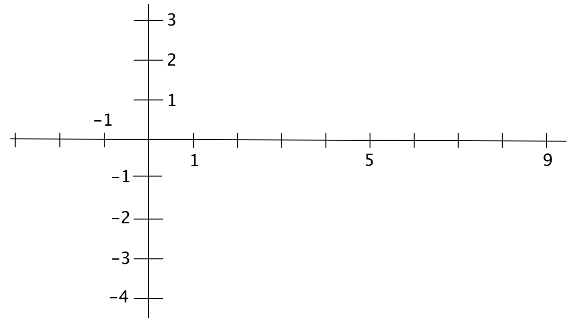
(a) The value(s) of t at which $g(t)$ is not continuous is/are ______________________________.

(b) The interval(s) on which $g(t)$ is continuous is/are ______________________________.

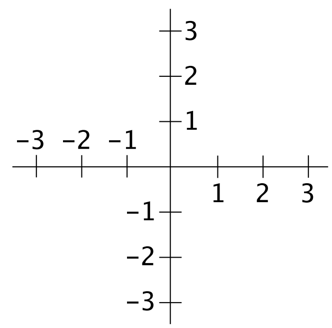
Graphs. *More accuracy = more points!*

1. On the axes below, sketch a graph of $f(x) = \log_2(x+1) - 3$.

   Label at least two points on the curve.

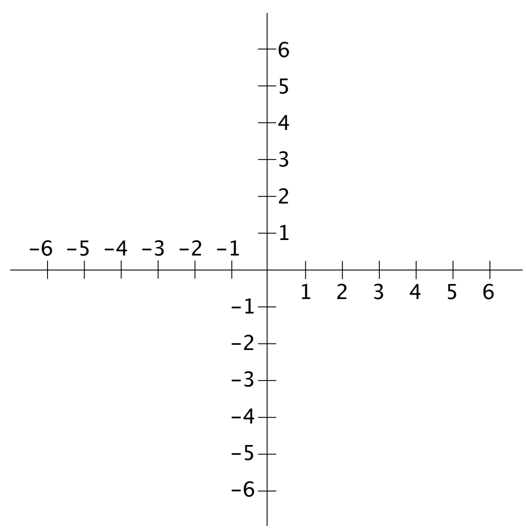


2. On the axes below, sketch a graph of $g(t) = \dfrac{t^2 - t - 2}{t - 2}$.



3. On the axes at right, sketch a graph of any function $f(x)$ satisfying all of the following:

   - $\lim\limits_{x\to 3^-} f(x) = 2$
   - $\lim\limits_{x\to 3^+} f(x) = -1$
   - $f(3) = 4$
   - $\lim\limits_{x\to -2} f(x) = 0$
   - $\lim\limits_{x\to 0} f(x)$ does not exist



Work and Answer. *You must show all relevant work to receive full credit.*

1. Simplify the expression $\log_3\left(\dfrac{27x^4}{3^{y+2}}\right)$.

2. Compute $\lim\limits_{x \to 0^-} \dfrac{|x| - x}{x}$. If the limit does not exist, explain why.

3. Find the domain of the function $f(x) = \sqrt[20]{-x^2 - 3x + 4}$. *Express your answer in interval notation.*

4. Compute $\lim\limits_{x \to \infty} \dfrac{|x| - x}{x}$. If the limit does not exist, explain why.

5. For the function $f(x) = \dfrac{2x^2 - x - 3}{x^2 - 4x - 5}$,

   (a) Find the equation(s) of the vertical asymptote(s) of $f(x)$.

   (b) Find the equation(s) of the horizontal asymptote(s) of $f(x)$.

6. Compute $\lim\limits_{x \to \infty} \dfrac{\sqrt[4]{7x^{12} - 4x^3 + 5}}{2x - \sqrt{5}x^3}$. If the limit does not exist, explain why.

7. Compute $\lim\limits_{x \to -\infty} \dfrac{\sqrt[4]{7x^{12} - 4x^3 + 5}}{2x - \sqrt{5}x^3}$. If the limit does not exist, explain why.

Some kind of **BONUS.**