

Math 124 H - Autumn 2022
Midterm Exam Number One
October 25, 2022

Name: _____

Student ID no. : _____

Signature: _____

1	16	
2	8	
3	8	
4	16	
5	12	
Total	60	

This grid is purely decorative.

The exam is graded online.

- This exam consists of **FIVE** problems on **FOUR** double-sided pages. The fourth page is left blank for scratch work.
- Show all work for full credit.
- You may use a TI-30X IIS calculator during this exam. Other calculators and electronic devices are not permitted.
- Please evaluate trig functions at nice values on the unit circle when possible. You do not otherwise need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- Draw a box around your final answer to each problem.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- If you run out of room, write on one of the scratch work pages **and indicate that you have done so**. If you still need more room, raise your hand and ask for an extra page.
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 80 minutes to complete the exam.

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle “see first page” below a problem.

1. [4 points per part] Compute each limit. You may use any techniques you know.

If a limit does not exist, write DNE, ∞ , or $-\infty$ as appropriate.

(a) $\lim_{x \rightarrow 5} \sqrt{2^x + 7x}$

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

(c) $\lim_{t \rightarrow a} \frac{\sec(t) - \sec(a)}{t - a}$ (Your answer will include the constant a .)

(d) $\lim_{x \rightarrow \infty} \sin\left(\frac{\pi x^4 + 3}{3x^4 + \pi}\right)$

2. **[8 points]** Consider the curve $y = \frac{3}{x}$.

Give the equation for a tangent line to this curve which has a y -intercept of 8.

3. **[8 points]** Let $f(x) = x^3e^x + \sqrt{x}$. Compute $f''(x)$.

4. Consider the following piecewise function:

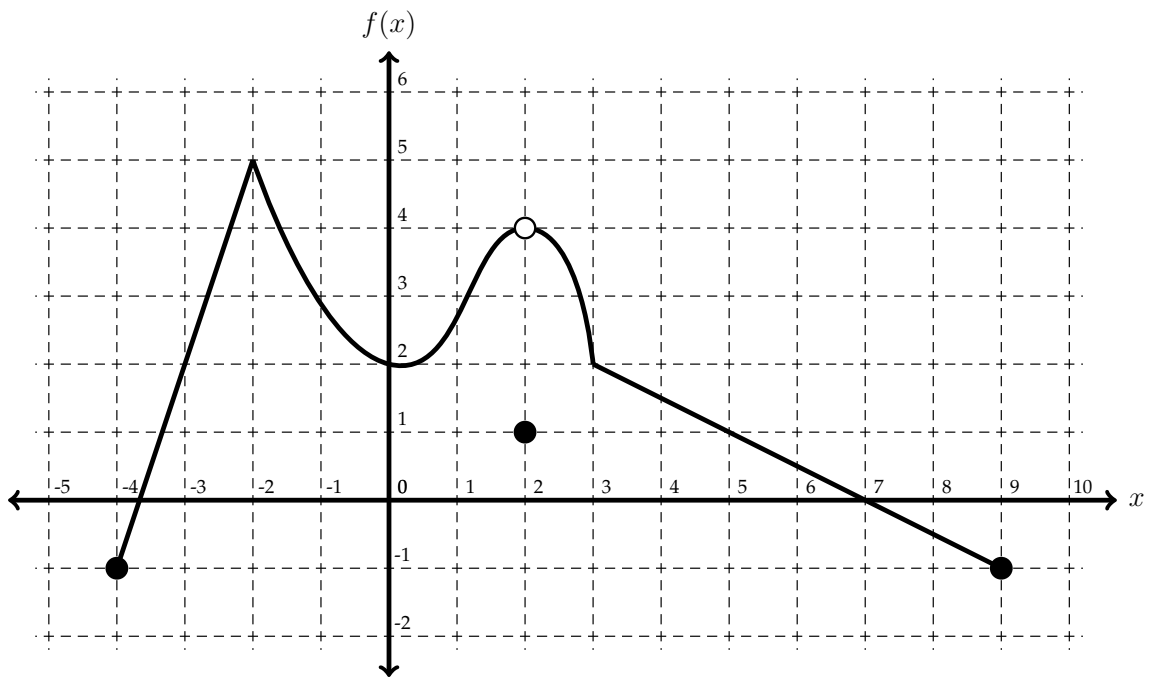
$$f(x) = \begin{cases} \frac{x^2 + ax - 21}{x - 3} & \text{if } x < 3 \\ b & \text{if } x = 3 \\ 3 \cos(x) + c & \text{if } x > 3 \end{cases}$$

(a) **[8 points]** Determine constants a , b , and c so that $f(x)$ is continuous at $x = 3$.

(b) **[8 points]** Find $f'(x)$. (Let a , b , and c be the values you found in part (a).)

(Note: your answer will be a piecewise function, just like $f(x)$.)

5. The graph of $f(x)$ is shown below.



Cool graph, right? Use it to answer the following questions.

(a) [3 points] Compute $\lim_{x \rightarrow 2} [f(x) \cdot f(x + 1)]$.

(b) [3 points] List all values in the open interval $(-4, 9)$ where f is *not* differentiable.

(c) [3 points] Compute $\lim_{h \rightarrow 0^+} \frac{f(3 + h) - 2}{h}$.

(d) [3 points] Let $g(x) = xf(x)$. What is $g'(-3)$?

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle “see back page” below a problem.

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