

*I pledge that I have neither given nor received
unauthorized assistance during this examination.*

Signature:

- **DON'T PANIC!** If you get stuck, take a deep breath and go on to the next question.
- Unless the problem says otherwise **you must show your work** sufficiently much that it's clear to me how you arrived at your answer.
- You may use a scientific calculator on this exam, but you may not use a graphing calculator.
- You may bring a two-sided sheet of notes on letter-sized paper in your own handwriting.
- There are 6 problems on 7 pages.

Question	Points	Score
1	16	
2	14	
3	12	
4	12	
5	12	
6	11	
Total:	77	

Good luck!

[16 points] 1. (a)

$$\lim_{x \rightarrow -2} \frac{x^2 + 6x + 8}{x + 2} =$$

(b)

$$\lim_{y \rightarrow 1} \frac{y^2 + y - 5}{-y^3 - 2y - 1} =$$

(c)

$$\lim_{x \rightarrow \infty} \frac{\sqrt{4x^4 + x^2 + 3x + 1}}{x^2 + 1} =$$

(d)

$$\lim_{t \rightarrow -\infty} \frac{2t^2 - t + 2}{t^3 - 4} =$$

2. A ball is thrown directly upward in the air. Its height in meters at time t seconds is given by the formula

$$h(t) = -5t^2 + 20t.$$

[6 points]

- (a) What is the average velocity of the ball from time 0 to time 2?

[8 points]

- (b) How fast is the ball moving at time 2?

[12 points] 3. Let

$$f(x) = \frac{x^2 + 1}{3x - 2}.$$

(a) Does this function have any vertical asymptotes? If so, where do they occur? Justify your answer (briefly).

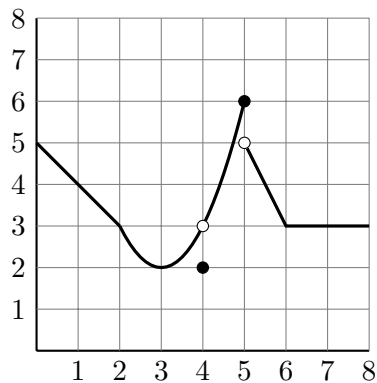
(b) Does this function have any horizontal asymptotes? If so, what are their values? Justify your answer (briefly).

[12 points] 4. (a) Compute $\frac{d}{dx}(2x^3 - 7x + 1)$.

(b) Let $g(u) = 3u^4 - \frac{1}{\sqrt{u}}$. Find $g'(1)$.

- [12 points] 5. Let $f(x) = (x + 1)^2$. Using the definition of the derivative directly, compute $f'(2)$.
Warning: You will not receive credit for using differentiation rules. You must use limits to compute the derivative directly from the definition.

[11 points] 6. Here is the graph of a function $f(x)$ on the domain $0 \leq x \leq 8$:



Evaluate the following expressions. If the value does not exist, say so. You do not need to justify your answers.

(a) $f(1) =$

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

(c) $f'(1) =$

(d) $f'(3) =$

(e) $\lim_{x \rightarrow 4} f(x) =$

(f) $f(5) =$

(g) $\lim_{x \rightarrow 5^+} f(x) =$

(h) $\lim_{x \rightarrow 5} f(x) =$

(i) $\lim_{x \rightarrow 6} f(x) =$

(j) $f'(6) =$

(k) $f'(7) =$

This page can be used as scratch paper.