Each question topic and the point value is recorded in the tables below. You may review these topics from any resource at your leisure. Once you decide to start a review problem, you are on the clock and you must work without any external resources, including no calculator. Each problem can be done one at a time but must be finished in a single sitting. Answer each question in the space provided, if you run out of space, then you may continue on the back of the page. It is your responsibility to plan out your time to ensure that you can finish all problems within the 4.0 hours allotted. By writing your name and signing the pledge you are stating that your work adheres to these terms and the Davidson honor code.

Scoring Table

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
Total:	40	

Topics Table

Question	Topic
1	Continuity
2	The Derivative
3	Derivative Rules
4	Applications

Time Table

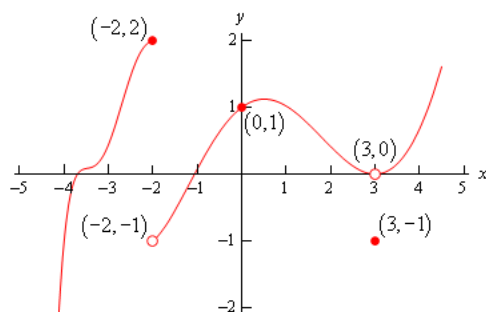| Question	1	2	3	4
Time				

1. Let f be a function defined over the real numbers.

   (a) (2 points) State the limit definition of f being continuous at a real number c.

   (b) (2 points) Use the definition in (a) to find and justify where the function below is discontinuous.

   (c) (6 points) Suppose that f is a polynomial. Then, use limit rules to justify why $\lim_{x \to c} f(x) = f(c)$.

2. Let f be a function defined over the real numbers.

    (a) (2 points) State the limit definition of the derivative, if it exists, of f at a real number x.

    (b) (4 points) Let $f(x) = \sqrt{x}$. Then, use the definition in (a) to find the derivative of f.

    (c) (4 points) Let $f(x) = |x|$. Then, use the definition in (a) to show that $f'(0)$ does not exist.

3. (a) (5 points) Compute the derivative of

$$f(x) = (x^2 - 1)^3 \frac{\sqrt{-2x^2 + 1}}{3x^4 - 2}.$$

Clearly state what derivative rules you are using and where you are using them.

(b) (5 points) Compute the derivative of

$$f(x) = \log_4 \left(\frac{e^{\sin(x)}}{3^{\cos x}} \right).$$

Clearly state what derivative rules you are using and where you are using them.

4. An athletic field is to be built in the shape of a rectangle x units long capped by semicircle regions of radius r at the two ends (e.g. see Richardson Stadium). This field is to be bounded by a 400 meter track.

   (a) (4 points) Express the area of the rectangular portion of the field as a function of x alone or r alone (your choice).

   (b) (6 points) What values of x and r give the rectangular portion the largest possible area?