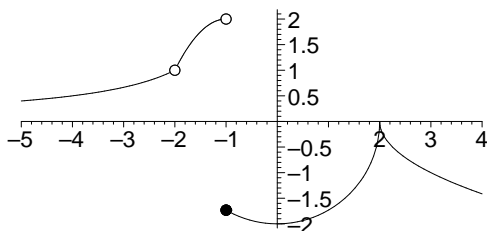


This test consists of 4 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

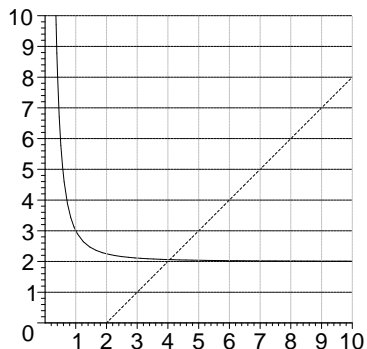
1. Use the graph of a function g shown below to answer the following questions:



- (4) (a) Find $\lim_{x \rightarrow -2} g(x)$
- (4) (b) Find $\lim_{x \rightarrow -1^+} g(x)$
- (4) (c) Where does g fail to be continuous?
- (4) (d) Where does g fail to be differentiable?

(4) 2. The following graph shows two continuous functions, f and g , both with domains $(-\infty, \infty)$, where f is the linear function with the dashed plot. Use the graphs to compute

$$\lim_{x \rightarrow \infty} (f(g(x)))$$



3. Use algebra and the limit laws to evaluate the following limits

(10) (a) $\lim_{x \rightarrow -1} x^2 - 6x + 5\sqrt{3-x}$

(10) (b) $\lim_{x \rightarrow -\infty} \frac{2x + 5}{\sqrt{4x^2 - 8x + 3}}$

(10) (c) $\lim_{x \rightarrow 8} \frac{\sqrt{x+1} - 3}{x - 3}$

(10) (d) If $\lim_{x \rightarrow 2} f(x) = 5$ and $\lim_{x \rightarrow 2} g(x) = -1$, find $\lim_{x \rightarrow 2} f(x)g(x)$

- (10) 4. Use either the “ $h \rightarrow 0$ ” or the “ $x \rightarrow a$ ” definition of the derivative to find $f'(4)$ if $f(x) = x^3 - 2x - 1$

- (10) 5. Give an ϵ - δ proof to show

$$\lim_{x \rightarrow -1} (2x + 5) = 3$$

- (10) 6. Use the intermediate value theorem to prove that the equation $\cos(x) - x = 0$ has a solution in the interval $[0,1]$

- (10) 7. Find an inverse for the function

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