VCU

MATH 200

CALCULUS I

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TEST 1

✍⁑

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Name: _____

Score: _____

Directions. Answer the questions in the space provided. Unless noted otherwise, you must show and explain your work to receive full credit. Put your final answer in a ⎡box⎤ when appropriate.

This is a closed-book, closed-notes test. Calculators, computers, etc., are not used.

1. (25 points) Warmup: short answer.

(a) $\tan\left(\dfrac{5\pi}{3}\right) =$

(b) Describe the domain of $f(x) = \dfrac{x+1}{x\sqrt{x+5}}$.

(c) Suppose $h(x) = \dfrac{\sin(\sqrt{x})}{\sqrt{x}}$.

State functions $f(x)$ and $g(x)$ for which $h(x) = f \circ g(x)$.

(d) $\displaystyle\lim_{x \to 3}\left(\dfrac{x^2 - 1}{x^3}\right)^{\frac{2}{3}} =$

(e) $\displaystyle\lim_{x \to \frac{\pi}{2}^+} \tan(x) =$

2. (15 points) Consider the equation $2\sin^2(x) = -\sin(x)$.

Find all solutions x of this equation for which $0 \leqslant x \leqslant 2\pi$.

3. (15 points) Evaluate the following limits.

(a) $\displaystyle \lim_{x \to 2} \frac{\sin(2x - 4)}{5x - 10} =$

(b) $\displaystyle \lim_{h \to 0} \frac{\sqrt{4 + h} - 2}{h} =$

(c) $\displaystyle \lim_{x \to 3} \frac{\dfrac{1}{x^2} - \dfrac{1}{9}}{x - 3} =$

4. (15 points) Sketch the graph of any function that meets all of the following criteria.
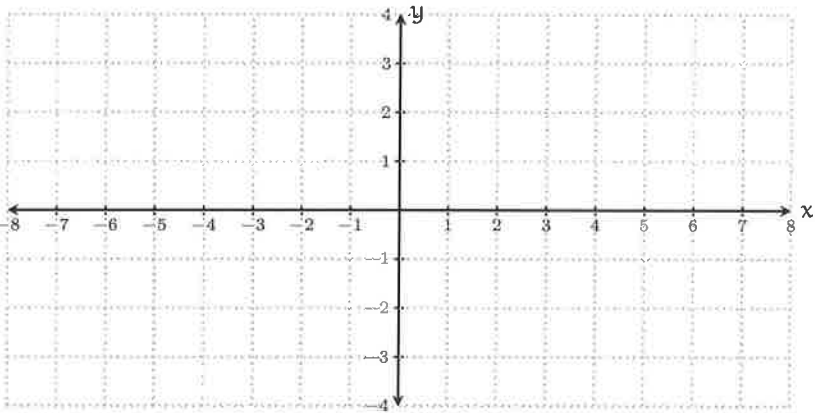
1. $f(-1) = 3$

2. $\lim\limits_{x \to \infty} f(x) = -2$

3. The line $y = 3$ is a horizontal asymptote

4. $\lim\limits_{x \to 2^+} f(x) = -\infty$ and $\lim\limits_{x \to 2^-} f(x) = \infty$

5. $\lim\limits_{x \to -1} f(x) = 2$

6. $f(x)$ continuous at every x value except $x = -1$ and $x = 2$

5. (15 points) This question concerns the function $f(x) = \dfrac{15 - 12x - 3x^2}{50 - 2x^2}$.

(a) State the intervals on which $f(x)$ is continuous.

(b) Find the horizontal asymptotes (if any).

(c) Find the vertical asymptotes (if any).

6. (15 points) Two functions $f(x)$ and $g(x)$ are graphed below. Answer the following questions.

(a) $\lim\limits_{x \to 3} f(x) =$

(b) Find c if $\lim\limits_{x \to c} f(x) = 0$.

(c) $\lim\limits_{x \to -2} \dfrac{3 f(x) g(x)}{\sqrt{12 + f(x)}} =$

(d) $g \circ f(-2) =$

(e) $\lim\limits_{x \to 3} f(g(x)) =$