

## Quiz 2

Name:

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This quiz has 3 questions worth 23 points on 3 pages. Try to do as many questions as possible. You can use your calculator.

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1. The function  $r(x)$  is given by the following formula, where  $c$  is a positive constant:

$$r(x) = \begin{cases} \frac{3x+3}{(x+5)(x-2)} & x < 0 \\ \frac{c}{x^3-1} & 0 \leq x < 4 \\ \sqrt{2-\frac{8}{x}} & x \geq 4 \end{cases}$$

It is not necessary to show work in this problem

- (a) (2 points) Find  $\lim_{x \rightarrow -\infty} r(x)$ . If the limit does not exist, write DNE.

$$\lim_{x \rightarrow -\infty} r(x) = \underline{\hspace{2cm}}$$

- (b) (2 points) For what value(s) of  $x$  does  $r(x)$  have a vertical asymptote? Write **NONE** if there are no such values.

$$x = \underline{\hspace{2cm}}$$

- (c) (2 points) For what value(s) of  $x$  is  $r(x) = 0$ ? Write **NONE** if there are no such values.

$$x = \underline{\hspace{2cm}}$$

- (d) (2 points) For what value(s) of  $c$  is the function  $r(x)$  continuous at  $x = 0$ ? Write **NONE** if there are no such values.

$$c = \underline{\hspace{2cm}}$$

2. (7 points) Consider the function  $f(x)$  defined by

$$f(x) = \begin{cases} xe^{Ax} + B & x < 3 \\ C(x-3)^2 & 3 \leq x \leq 5 \\ \frac{130}{x} & x > 5 \end{cases}$$

Suppose  $f(x)$  satisfies all of the following:

- $f(x)$  is continuous at  $x = 3$ .
- $\lim_{x \rightarrow 5^+} f(x) = 2 + \lim_{x \rightarrow 5^-} f(x)$ .
- $\lim_{x \rightarrow -\infty} f(x) = -4$ .

Find the values of  $A$ ,  $B$  and  $C$ . Show your work. Your answer must be in *exact form*. DO NOT USE decimal approximations.

3. (8 points) On the axes provided below, sketch the graph of a single function  $f$  satisfying all of the following:

- (1) The graph of  $f$  is concave up for  $x < -2$ .
- (2) The graph of  $f$  has a vertical asymptote at  $x = -2$ .
- (3)  $f'(-1) = -3$ .
- (4)  $\lim_{x \rightarrow 0} f(x) = 2$ .
- (5)  $f(0) = -2$ .
- (6)  $\lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1^+} f(x)$ .
- (7)  $f$  is not continuous at  $x = 1$ .
- (8)  $f'(x) > 0$  for  $x > 3$ .
- (9)  $\lim_{x \rightarrow \infty} f(x) = 4$

