BC Calculus 2018-19 Name____________________________
Limit and Continuity Test
NO CALCULATOR ALLOWED Score______

1. Let $f(x)=\begin{cases} \cos x, \ if \ x \le 0 \\ 1+\sqrt{x}, \ if \ 0 < x \end{cases}$. Which of the following statements is true about f?

I. f is continuous at $x = 0$.
II. f is differentiable at $x = 0$.
III. f has a local maximum at $x = 0$.

a) I only b) II only c) III only d) I and II e) II and III only

ab) I and III only ac) I, II, and III ad) None of these

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2. The function f is not differentiable at $x = b$. Which of the following statements **must** be true?

(a) $\lim_{x \to b} f(x)$ dne (b) $\lim_{x \to b} f(x) \neq f(b)$ (c) $\lim_{x \to b^-} f(x) = \lim_{x \to b^+} f(x)$

(d) $\lim_{x \to b^-} f'(x) \neq \lim_{x \to b^+} f'(x)$ (e) None of these

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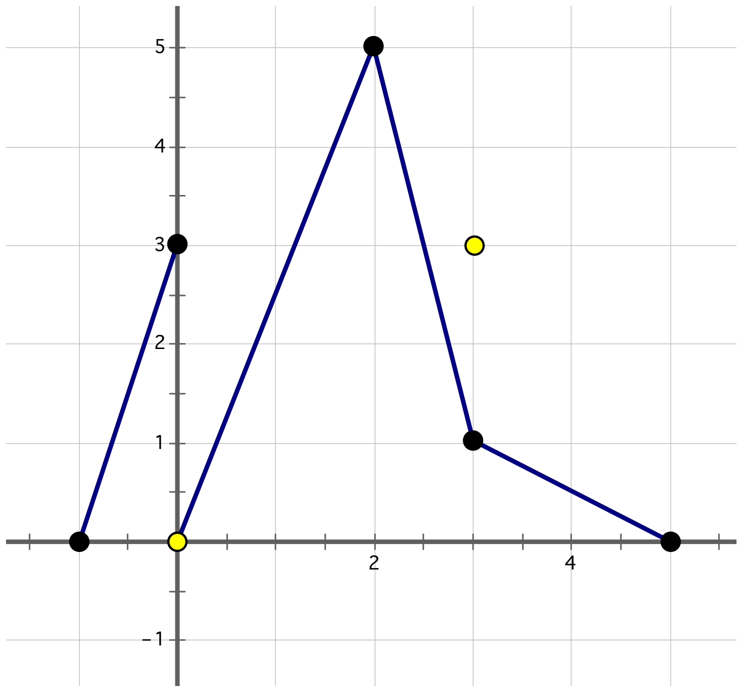
3. The function f is defined on the interval $x \in [-1, 5]$ and has the graph shown below.



Which of the following is (are) false?

I. $\lim_{x \to 2} f(x) = 2$

II. $\lim_{x \to 3} \frac{f(x) - f(3)}{x - 3} = dne$

III. $\lim_{x \to 0^-} f(x) = f(3)$

a) I only b) II only c) III only

d) I and II only e) I and III only

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4. $\lim_{h\to 0} \dfrac{\ln\left(\dfrac{2+h}{2}\right)}{h} =$

(a) e^2 (b) 1 (c) $\dfrac{1}{2}$ (d) 0 (e) DNE

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5. $\lim_{x\to\infty} \dfrac{4x^5+3x^4+2x^3+x^2+1}{3x^6-9x^4+4x^3+15} =$

(a) 0 (b) $\dfrac{3}{4}$ (c) $\dfrac{4}{3}$ (d) 3 (e) DNE

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6. Which of the following improper integrals diverge?

I. $\displaystyle\int_0^\infty \frac{2x}{1+x^2}\,dx$ II. $\displaystyle\int_0^9 \frac{1}{\sqrt{x}}\,dx$ III. $\displaystyle\int_1^\infty \frac{1}{\sqrt{x}}\,dx$

(a) I only (b) II only (c) I and II only

(d) II and III only (e) I and III only

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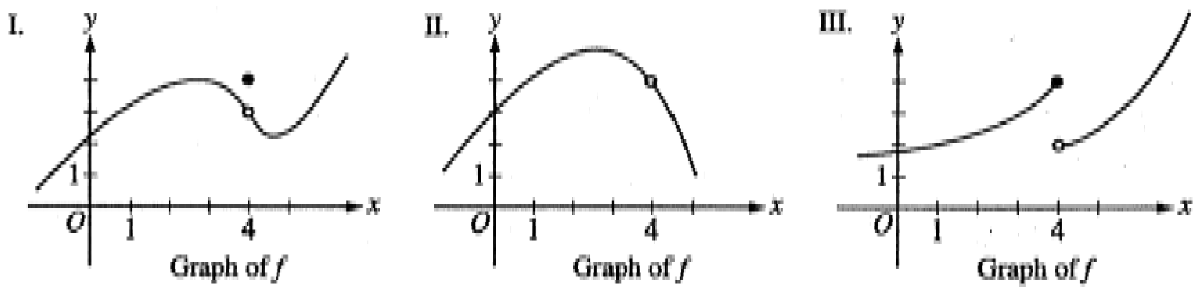
7. For which of the following does $\lim_{x \to 4} f(x)$ exist?



(a) I only (b) II only (c) III only (d) I and II only (e) I and III only

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8. Let $f(x)=\begin{cases} \sin^{-1}(1-x), & \text{if } x<1 \\ 0, & \text{if } x=1 \\ \ln x^2, & \text{if } x>1 \end{cases}$. Which of the following statements is true about f?

I. f is continuous at $x = 1$.
II. f is differentiable at $x = 1$.
III. f has a local minimum at $x = 1$.

a) I only b) II only c) III only d) I and II e) II and III only

ab) I and III only ac) I, II, and III ad) None of these

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9. Which of the following functions is NOT differentiable at $x=0$?

(a) $f(x)=x^2$ (b) $f(x)=e^x$ (c) $f(x)=\ln(x+1)$

(d) $f(x)=\begin{cases} \frac{1}{x+1} & \text{for } x\neq -1 \\ 0 & \text{for } x=-1 \end{cases}$ (e) $f(x)=\cot x$

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10. Let $F(x)=\int_{-2}^{x^2-3x} e^{t^2}\,dt$. At what value of x does $F(x)$ attain a minimum?

(a) No values of x (b) $\frac{1}{2}$ (c) $\frac{3}{2}$ (d) 2 (e) 3

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11. The function f is defined for all Real numbers such that

$$f(x)=\begin{cases} x^2+kx & \text{for } x<3 \\ 5\sin\frac{\pi}{2}x & \text{for } x\geq 3 \end{cases}.$$

For which value of k will the function be continuous throughout its domain?

(a) -2 (b) -1 (c) $\frac{2}{3}$ (d) 1 (e) None of these

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12. Given $f(x)=\frac{1}{\sqrt{x}}$, $\int_0^\infty \frac{1}{\sqrt{x}}$ is

a) convergent.

b) divergent because $\lim_{x\to 0^+} f(x)$ does not exist.

c) divergent because $\lim_{x\to\infty} f(x)$ does not exist.

d) divergent because neither $\lim_{x\to 0^+} f(x)$ nor $\lim_{x\to\infty} f(x)$ exist.

e) none of the above.

AP Calculus BC 2018-19 Name____________________________
Limit/Continuity Test
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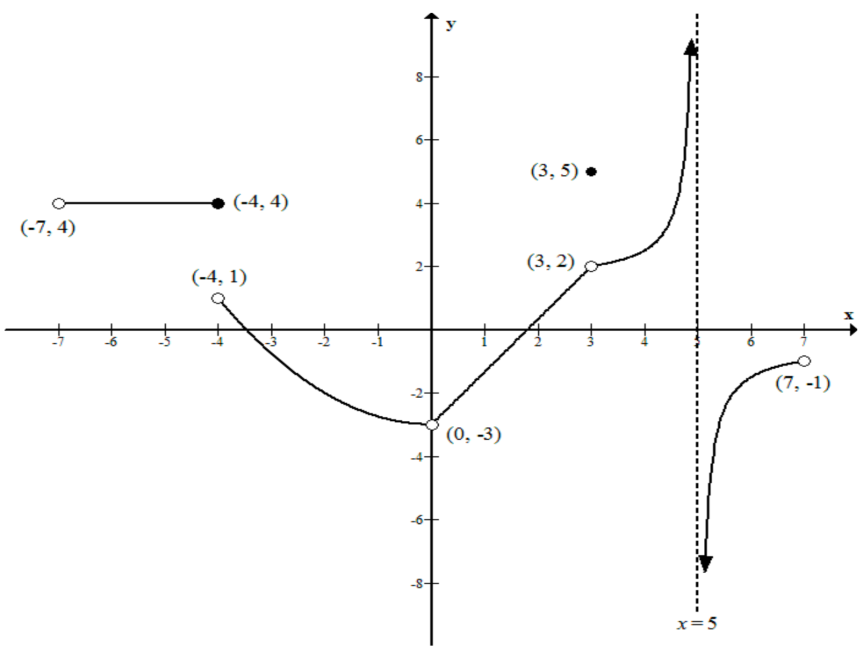
1. $f(x)=\begin{cases} \sin(1-x), \text{ if } x<1 \\ 0 \quad , \quad \textit{if } x=1 \\ \ln\frac{1}{x}, \text{ if } 1<x \end{cases}$

a) Is $f(x)$ continuous? Why/Why not?

b) Is $f(x)$ differentiable? Why/Why not?

2. Evaluate $\int_{-\infty}^{0} xe^{-x^2}\ dx$



3. For this graph, find

(a) $\lim_{x \to -4^-} f(x) =$ (b) $\lim_{x \to -4^+} f(x) =$ (c) $\lim_{x \to 3} f(x) =$

(d) $\lim_{x \to -4} f(x) =$ (e) $\lim_{x \to 5^+} f(x) =$ (f) $\lim_{x \to 5^-} f(x) =$

(g) $f(-4) =$ (h) $\lim_{x \to 0} f(x) =$ (i) $f(0) =$ (j) $f(3) =$

4. $\int_{-2}^{0} \frac{1}{\sqrt{4-x^2}}\,dx$