

KING SAUD UNIVERSITY DEANSHIP OF COMMON FIRST YEAR BASIC SCIENCES DEPARTMENT

Question 1 Use the graph of $f(x)$ to answer the following questions (if any) 1. $\lim_{x\to 3} f(x)$ 2. $\lim_{x\to 0} f(x)$ 3. $2f(-2)+3\lim_{x\to 0} \frac{f(x)}{x+1}$ 4. Find all vertical asymptotes of f (if any). 5. Find all horizontal asymptotes of f (if any). 6. Discuss the continuity of f on its domain.		
1. $\lim_{x\to 3} f(x)$ 2. $\lim_{x\to 0} f(x)$ 3. $2f(-2) + 3\lim_{x\to 2} \frac{f(x)}{5x+1}$ 4. Find all vertical asymptotes of f (if any). 5. Find all horizontal asymptotes of f (if any).	Question 1	6 Marks (1 each)
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Use the definition of limit to show the following:		
1. $\lim_{x \to -2} (1 - 2x) = 5$	2.	$\lim_{x \to \frac{3}{2}^+} \sqrt{2x - 3} = 0$

Α.	Find all horizontal	asymptotes	for the	following	functions ((if anv)
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1.
$$f(x) = \frac{2x - 1}{\sqrt{9x^2 + 4x} - x}$$

2.
$$f(x) = \frac{x}{\sqrt{9 - x^2}}$$

B. Find all vertical asymptotes for the following functions (if any)

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

Find the value of a and b such that:	
$\lim_{x \to 0} \frac{a - \cos(bx)}{x^2} = 8$	

Question 5 20 Marks (2 each)

Find the following limits (if exists)

1.
$$\lim_{x \to -1} \frac{x^2 - 1}{2x + 1}$$

$$3. \quad \lim_{x \to \infty} (\sqrt{x^2 + 2} - x)$$

$$5. \quad \lim_{x \to 3} \frac{x-3}{|x-3|}$$

7.
$$\lim_{x \to 0^+} \frac{\sqrt{1 - \sin^2(\frac{\pi}{2} - x)}}{3x}$$

9.
$$\lim_{x \to 2} \cos \left(\frac{x^2 - 4}{x + 1} \right)$$

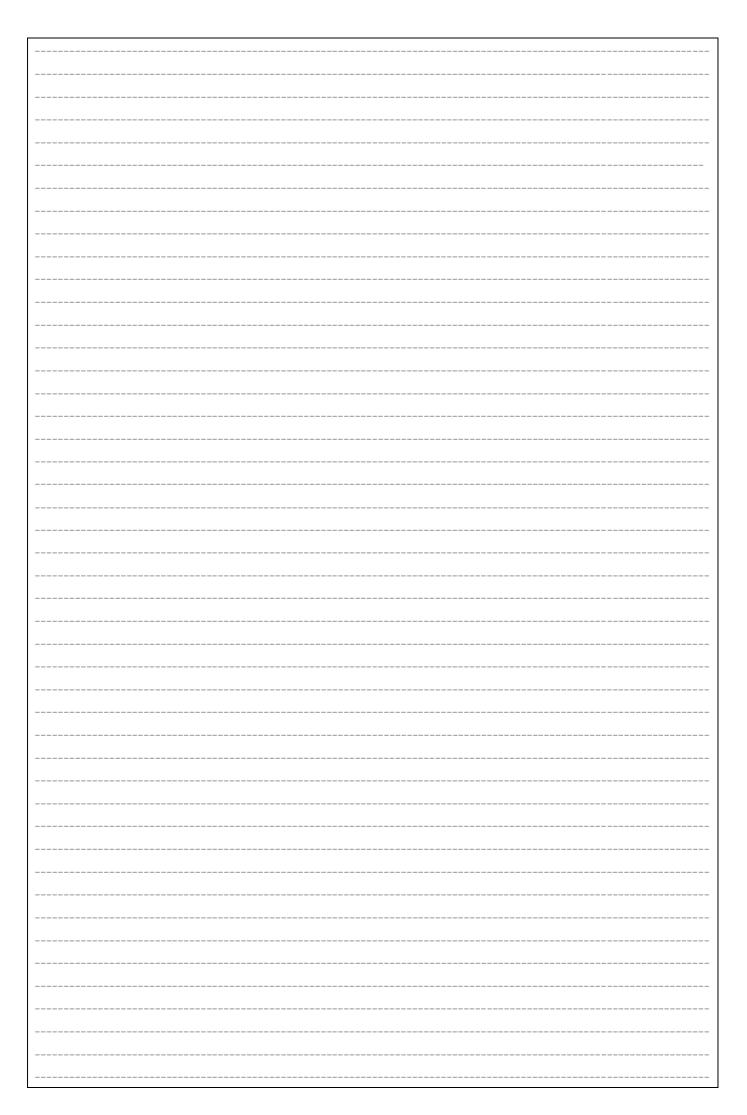
$$2. \quad \lim_{x \to 0} \frac{(x+2)^3 - 8}{x}$$

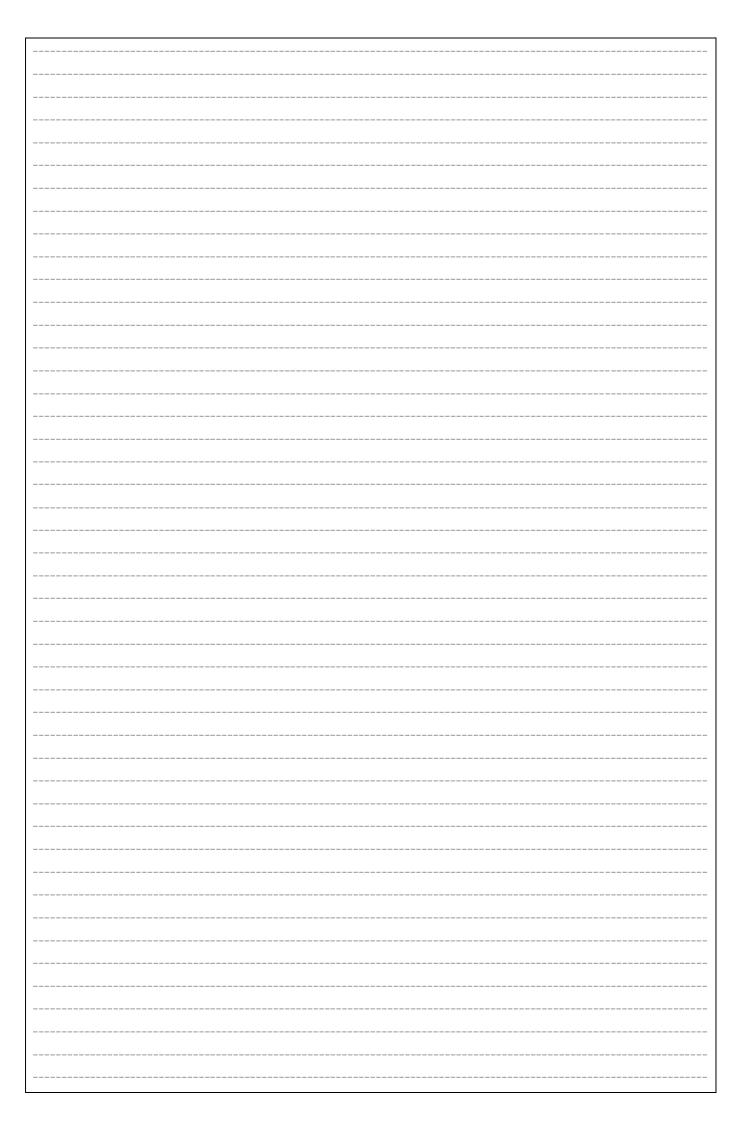
4.
$$\lim_{x \to 1} \left(\frac{1}{x-1} - \frac{2}{x^2 - 1} \right)$$

$$6. \quad \lim_{x \to \infty} \frac{2x + \sin x}{4x + 1}$$

$$8. \quad \lim_{x \to 0} \left[\frac{1}{x} \left(\frac{1}{\sqrt{1+x}} - 1 \right) \right]$$

10.
$$\lim_{x\to 0} \frac{x}{\tan(2x) + \sin(3x)}$$





- **A.** Discuss the continuity of the function $f(x) = \cos(x^2 + 1)$.
- **B.** Use the Intermediate Value Theorem to prove that the equation $\frac{x^5+1}{x+3}=3$ has at least a real solution.
- C. Find the constants a and b such that the function

$$f(x) = \begin{cases} \sqrt{\frac{x+4}{x+b}}, & x > 0\\ a+b, & x = 0\\ \frac{\sin(2x)}{3x}, & x < 0 \end{cases}$$

(3x)
is continuous on $\mathbb{R}.$

