Limits: Trigonometry, Exponentials, and Derivatives

Use the reference table and your limit knowledge to solve these problems.

Essential Values Reference Table

Angle	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\sin\theta$	0	1	0	-1	0
$\cos\theta$	1	0	-1	0	1
$\tan\theta$	0	undefined	0	undefined	0

Function	e^0	e^1	$\ln(1)$	$\ln(e)$
Value	1	$e \approx 2.718$	0	1

Note: $\ln(0)$ is undefined (approaches $-\infty$)

Problem 1: Evaluating Limits

Evaluate each limit using direct substitution from reference table above.

1. $\lim_{x\to 0} \dfrac{\sin(\pi - x)}{\cos(x)}$

2. $\lim_{x\to \frac{\pi}{2}} \cos(x) + \sin(x)$

3. $\lim_{x\to 1} \dfrac{e^x - e^1}{x - 2} \cdot \ln(x)$

4. $\lim_{x\to 0^+} \dfrac{\sin(x) + \cos(\pi)}{\ln(x+1)}$

5. $\lim_{x \to \pi} \dfrac{\cos(x) \cdot e^0}{\cos(x) + 2}$

Problem 2: Recognizing the Limit Definition of the Derivative

Each limit below represents $f'(a)$ for some function f and some value a. Identify the function $f(x)$ and the point a where the derivative is being evaluated.

Recall: $f'(a) = \lim_{h \to 0} \dfrac{f(a+h) - f(a)}{h}$

6. $\lim_{h \to 0} \dfrac{(3+h)^2 - 9}{h}$

Function $f(x) =$ _____ Point $a =$ _____

7. $\lim_{h \to 0} \dfrac{\sin(2+h) - \sin(2)}{h}$

Function $f(x) =$ _____ Point $a =$ _____

8. $\lim_{h \to 0} \dfrac{e^{1+h} - e}{h}$

Function $f(x) =$ _____ Point $a =$ _____

9. $\lim_{h \to 0} \dfrac{\ln(5+h) - \ln(5)}{h}$

Function $f(x) =$ _____ Point $a =$ _____

10. $\lim_{h \to 0} \dfrac{\cos(\pi + h) - (-1)}{h}$

Function $f(x) =$ _____ Point $a =$ _____

Problem 3: Multiplying by Conjugates

Evaluate each limit by multiplying by the appropriate conjugate.

11. $\lim_{x \to 4} \dfrac{\sqrt{x} - 2}{x - 4}$

12. $\lim_{x \to 0} \dfrac{\sqrt{x + 9} - 3}{x}$

13. $\lim_{x \to 1} \dfrac{x - 1}{\sqrt{x + 3} - 2}$