

## LEMBAR KERJA PESERTA DIDIK (LKPD)

### LIMIT FUNGSI TRIGONOMETRI

NAMA :

KELAS :

**A. Petunjuk:** Pilihlah satu jawaban yang benar.

1.  $\lim_{x \rightarrow 0} \frac{\sin 2x}{\sin 6x} = \dots$

A.  $\frac{1}{6}$

B.  $\frac{1}{3}$

C. 2

D. 3

E. 6

2.  $\lim_{x \rightarrow 0} \frac{\sin 7x + \tan 3x - \sin 5x}{\tan 9x - \tan 3x - \sin x} = \dots$

A. 9

B. 7

C. 5

D. 3

E. 1

3.  $\lim_{x \rightarrow 0} \frac{\sin^3 2x}{\tan^3 \frac{1}{2}x} = \dots$

A.  $2^3$

B.  $2^4$

C.  $2^5$

D.  $2^6$

E.  $2^7$

4.  $\lim_{x \rightarrow 0} \frac{2x^2 + x}{\sin x} = \dots$

A. -1

B. 0

C. 1

D. 2

E. 3

5.  $\lim_{x \rightarrow 0} \frac{\tan 2x \cdot \tan 3x}{3x^2} = \dots$

A. 0

B.  $\frac{2}{3}$

C.  $\frac{3}{2}$

D. 2

E. 6

6.  $\lim_{x \rightarrow 0} \frac{3 \sin x \cos x}{4x} = \dots$

A. 0

B.  $\frac{1}{4}$

C.  $\frac{3}{4}$

D.  $\frac{3}{2}$

E.  $\infty$

|                                                                 |      |                   |                   |      |
|-----------------------------------------------------------------|------|-------------------|-------------------|------|
| 7. $\lim_{x \rightarrow 0} \frac{\sin^2 2x}{2x \tan x} = \dots$ |      |                   |                   |      |
| A. $\frac{5}{3}$                                                | B. 2 | C. $\frac{10}{3}$ | D. $\frac{25}{8}$ | E. 5 |

|                                                                             |      |      |      |      |
|-----------------------------------------------------------------------------|------|------|------|------|
| 8. $\lim_{x \rightarrow 0} \frac{\sin 2x \sin 3x}{\tan 3x \tan 2x} = \dots$ |      |      |      |      |
| A. 1                                                                        | B. 2 | C. 3 | D. 4 | E. 5 |

|                                                                 |                  |                  |                  |      |
|-----------------------------------------------------------------|------------------|------------------|------------------|------|
| 9. $\lim_{x \rightarrow 0} \frac{3 \csc 2x}{4 \cot 3x} = \dots$ |                  |                  |                  |      |
| A. $\frac{1}{2}$                                                | B. $\frac{3}{4}$ | C. $\frac{8}{9}$ | D. $\frac{9}{8}$ | E. 2 |

|                                                                  |                  |                  |                  |             |
|------------------------------------------------------------------|------------------|------------------|------------------|-------------|
| 10. $\lim_{x \rightarrow 0} \frac{2 \cot 6x}{4 \csc 3x} = \dots$ |                  |                  |                  |             |
| A. 0                                                             | B. $\frac{1}{4}$ | C. $\frac{3}{4}$ | D. $\frac{3}{2}$ | E. $\infty$ |

**B. Isilah titik-titik berikut dengan jawaban yang tepat.**

**Catatan penting : jangan memberi spasi pada penulisan  $\sin x$ ,  $\cos x$ ,  $\tan x$  dan bentuk jawaban lainnya.**

$$\begin{aligned}
 1. \quad \lim_{x \rightarrow 0} \frac{(x^2 - 1) \sin 6x}{x^3 + 3x^2 + 2x} &= \lim_{x \rightarrow 0} \frac{(\dots - \dots)(\dots + \dots) \dots}{\dots (x^2 + 3x + 2)} \\
 &= \lim_{x \rightarrow 0} \frac{(\dots - \dots)(\dots + \dots) \dots}{\dots (\dots + \dots)(\dots + \dots) \dots} \\
 &= \lim_{x \rightarrow 0} \left( \frac{\dots - \dots}{\dots + \dots} \right) \cdot \lim_{x \rightarrow 0} \frac{\dots}{\dots} \\
 &= \frac{0 - 1}{0 + 2} \cdot 6 \\
 &= \dots
 \end{aligned}$$

$$2. \quad \lim_{x \rightarrow 0} \frac{4 \sin^2 2x}{x \tan 2x} = 4 \lim_{x \rightarrow 0} \frac{\sin^2 2x}{x} \cdot \lim_{x \rightarrow 0} \frac{1}{\tan 2x} = 4 \cdot 2 \cdot 1 = 8$$

$$\begin{aligned}
 3. \quad \lim_{x \rightarrow \frac{\pi}{4}} \frac{\cos^2 x - \sin^2 x}{\cos x - \sin x} &= \lim_{x \rightarrow \frac{\pi}{4}} \frac{(\cos x - \sin x)(\cos x + \sin x)}{\cos x - \sin x} \\
 &= \lim_{x \rightarrow \frac{\pi}{4}} (\cos x + \sin x) \\
 &= \cos \frac{\pi}{4} + \sin \frac{\pi}{4} \\
 &= \frac{\sqrt{2}}{2} \sqrt{\frac{1}{2}} + \frac{\sqrt{2}}{2} \sqrt{\frac{1}{2}} = \sqrt{\frac{1}{2}}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad \lim_{x \rightarrow 0} \frac{2x^2 + 4x}{\tan 2x} &= \lim_{x \rightarrow 0} \frac{2x(\cos^2 x + \sin^2 x)}{\sin 2x} \\
 &= \lim_{x \rightarrow 0} \frac{\cos^2 x}{\sin x} \cdot \lim_{x \rightarrow 0} (\cos x + \sin x) \\
 &= 1 \cdot (0 + 2) = 2
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \lim_{x \rightarrow 0} \frac{\sin 4x + \sin 2x}{3x \cos x} &= \lim_{x \rightarrow 0} \frac{1}{\cos x} \cdot \lim_{x \rightarrow 0} \left( \frac{\sin 4x + \sin 2x}{3x} \right) \\
 &= \lim_{x \rightarrow 0} \frac{1}{\cos x} \cdot \left\{ \lim_{x \rightarrow 0} \frac{\sin 4x}{3x} + \lim_{x \rightarrow 0} \frac{\sin 2x}{3x} \right\} \\
 &= \frac{1}{\cos 0^\circ} \cdot \left\{ \frac{\sin 4x}{3x} + \frac{\sin 2x}{3x} \right\} \\
 &= \frac{1}{1} \cdot \frac{\sin 4x + \sin 2x}{3x} \\
 &= 2
 \end{aligned}$$

**RUMUS RUMUS YANG DI GUNAKAN UNTUK MENJAWAB SOAL NO C**

$$1. \cos 2x = \begin{cases} \cos^2 x - \sin^2 x \\ 2 \cos^2 x - 1 \\ 1 - 2 \sin^2 x \end{cases}$$

$$2. \cos^2 ax + \sin^2 ax = 1$$

**Contoh :**  $\cos^2 x + \sin^2 x = 1$

$$\cos^2 2x + \sin^2 2x = 1$$

$$1 - \cos^2 2x = \sin^2 2x$$

$$3. 1 - \cos ax = 2 \sin^2 \left( \frac{a}{2} \right) x$$

$$4. \cos ax = 1 - 2 \sin^2 \left( \frac{a}{2} \right) x$$

$$5. \cos A - \cos B = -2 \sin \left( \frac{A+B}{2} \right) \sin \left( \frac{A-B}{2} \right)$$

C. Isilah kotak yang kosong dengan jawaban yang tepat yang terdapat pada keranjang jawaban.

$$\begin{aligned}
 1. \lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + \cos 2x}{2 \cos x} &= \lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + (\quad)}{2 \cos x} \\
 &= \lim_{x \rightarrow \frac{\pi}{2}} \frac{(\quad)}{2 \cos x} \\
 &= \lim_{x \rightarrow \frac{\pi}{2}} (\quad) \\
 &= \cos \frac{\pi}{2} \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 2. \lim_{x \rightarrow 0} \frac{x \sin x}{1 - \cos 2x} &= \lim_{x \rightarrow 0} \frac{x \sin x}{1 - (\quad)} \\
 &= \lim_{x \rightarrow 0} \frac{x \sin x}{(\quad)} \\
 &= \frac{1}{2} \lim_{x \rightarrow 0} \frac{x}{\sin x} \cdot \lim_{x \rightarrow 0} (\quad) \\
 &= \frac{1}{2} \cdot 1 \cdot 1 \\
 &= \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 3. \lim_{x \rightarrow 0} \frac{2x \tan 2x}{1 - \cos^2 4x} &= \lim_{x \rightarrow 0} \frac{2x \tan 2x}{1 - (\quad)} \\
 &= \lim_{x \rightarrow 0} \frac{2x}{\sin 4x} \cdot \lim_{x \rightarrow 0} (\quad) \\
 &= \frac{2}{4} \cdot \frac{2}{4} \\
 &= \frac{4}{16} = \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 4. \lim_{x \rightarrow 0} \frac{2x \sin 3x}{1 - \cos 6x} &= \lim_{x \rightarrow 0} \frac{2x \sin 3x}{(\quad)} \\
 &= \lim_{x \rightarrow 0} \frac{2x}{2 \sin 3x} \cdot \lim_{x \rightarrow 0} (\quad) \\
 &= \frac{1}{3} \cdot 1 \\
 &= \frac{1}{3}
 \end{aligned}$$

KERANJANG JAWABAN

$$\frac{\sin x}{\sin x}$$

$$2 \cos^2 x - 1$$

$$1 - 2 \sin^2 x$$

$$\cos x$$

$$\frac{\sin 3x}{\sin 3x}$$

$$2 \sin^2 x$$

$$2 \cos^2 x$$

$$2 \sin^2 3x$$

$$\frac{\tan 2x}{\sin 4x}$$

$$\sin^2 4x$$

$$5. \lim_{x \rightarrow 0} \frac{\cos 4x - 1}{x \tan 2x} = \lim_{x \rightarrow 0} \frac{-\boxed{\phantom{000}}}{x \tan 2x}$$

$$= - \lim_{x \rightarrow 0} \frac{\boxed{\phantom{000}}}{x \tan 2x}$$

$$= -2 \lim_{x \rightarrow 0} \boxed{\phantom{000}} \cdot \lim_{x \rightarrow 0} \frac{\sin 2x}{\tan 2x}$$

$$= -2 \cdot 2 \cdot 1$$

$$= -4$$

$$6. \lim_{x \rightarrow \frac{\pi}{4}} \frac{1 - \sin 2x}{\cos^2 2x} = \lim_{x \rightarrow \frac{\pi}{4}} \frac{1 - \sin 2x}{\boxed{\phantom{000}}}$$

$$= \lim_{x \rightarrow \frac{\pi}{4}} \frac{1 - \sin 2x}{\boxed{\phantom{000}}}$$

$$= \frac{1}{1 + \sin 2 \cdot \frac{\pi}{4}}$$

$$= \frac{1}{1 + 1}$$

$$= \frac{1}{2}$$

$$7. \lim_{x \rightarrow 0} \frac{\cos 2x - \cos x}{x \tan x} = \lim_{x \rightarrow 0} \frac{\boxed{\phantom{000}}}{x \tan x}$$

$$= -2 \lim_{x \rightarrow 0} \boxed{\phantom{000}} \cdot \lim_{x \rightarrow 0} \frac{\sin \frac{1}{2}x}{\tan x}$$

$$= -2 \cdot \frac{3}{2} \cdot \frac{1}{2}$$

$$= -\frac{3}{2}$$

$$(1 + \sin 2x)(1 - \sin 2x)$$

$$\frac{\sin 2x}{x}$$

$$\frac{\sin \frac{3}{2}x}{\frac{2}{x}}$$

$$2 \sin^2 2x$$

$$1 - \cos 4x$$

$$-2 \sin \frac{3}{2}x \sin \frac{1}{2}x$$

$$1 - \sin^2 2x$$