Zadatak 8. Skrati razlomak:

1) $\dfrac{\sin 5x \cdot \cos x - \cos 3x \cdot \sin x}{\cos^2 3x - \cos^2 x}$;

2) $\dfrac{\sin^2 2.5x - \sin^2 1.5x}{\cos 3x \cdot \cos 2x + \sin 4x \cdot \sin x}$.

Rješenje. **1)**

$$\frac{\sin 5x \cdot \cos x - \cos 3x \cdot \sin x}{\cos^2 3x - \cos^2 x} = \frac{\dfrac{1}{2}[\sin(5x + x) + \sin(5x - x)] - \dfrac{1}{2}[\sin(3x + x) + \sin(3x - x)]}{(\cos 3x - \cos x)(\cos 3x + \cos x)}$$

$$= \frac{\dfrac{1}{2}(\sin 6x + \sin 4x - \sin 4x + \sin 2x)}{-2\sin\dfrac{3x + x}{2}\sin\dfrac{3x - x}{2} \cdot 2\cos\dfrac{3x + x}{2}\cos\dfrac{3x - x}{2}}$$

$$= \frac{\dfrac{1}{2} \cdot 2\sin\dfrac{6x + 2x}{2}\cos\dfrac{6x - 2x}{2}}{-4\sin 2x \sin x \cos 2x \cos x} = \frac{\sin 4x \cos 2x}{-(2\sin 2x \cos 2x)(2\sin x \cos x)}$$

$$= \frac{\sin 4x \cos 2x}{-\sin 4x \sin 2x} = -\operatorname{ctg} 2x$$

2)

$$\frac{\sin^2 2.5x - \sin^2 1.5x}{\cos 3x \cdot \cos 2x + \sin 4x \cdot \sin x} = \frac{(\sin 2.5x - \sin 1.5x)(\sin 2.5x + \sin 1.5x)}{\dfrac{1}{2}[\cos(3x + 2x) + \cos(3x - 2x)] + \dfrac{1}{2}[\cos(4x - x) - \cos(4x + x)]}$$

$$= \frac{2\cos\dfrac{2.5x + 1.5x}{2}\sin\dfrac{2.5x - 1.5x}{2} \cdot 2\sin\dfrac{2.5x + 1.5x}{2}\cos\dfrac{2.5x - 1.5x}{2}}{\dfrac{1}{2}(\cos 5x + \cos x + \cos 3x - \cos 5x)}$$

$$= \frac{4\cos 2x \sin\dfrac{x}{2}\sin 2x \cos\dfrac{x}{2}}{\dfrac{1}{2} \cdot 2\cos\dfrac{x + 3x}{2}\cos\dfrac{1 - 3x}{2}} = \frac{\sin x \sin 4x}{\cos 2x \cos(-x)}$$

$$= \frac{\sin x \cdot 2\sin 2x \cos 2x}{\cos 2x \cos x} = \frac{2\sin x \cdot 2\sin x \cos x}{\cos x} = 4\sin^2 x$$