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$$\sin 2x \geq \cos^4 \frac{x}{2} - \sin^4 \frac{x}{2}$$

$$\sin 2x \geq (\cos^2 \frac{x}{2} - \sin^2 \frac{x}{2})(\cos^2 \frac{x}{2} + \sin^2 \frac{x}{2})$$

$$\sin 2x \geq \cos x \cdot 1$$

$$2 \sin x \cos x - \cos x \geq 0$$

$$\cos x (2 \sin x - 1) \geq 0$$

$$\downarrow$$
$$x = \frac{\pi}{2} + \pi k$$

$$\downarrow$$
$$x = \frac{\pi}{6} + 2\pi k$$

$$x = \frac{5\pi}{6} + 2\pi k$$

$$\underbrace{\left[ \frac{\pi}{6} \quad \frac{\pi}{2} \quad \frac{5\pi}{6} \quad \frac{3\pi}{2} \quad 2\pi \right]}_{+}$$

$$\boxed{\frac{\pi}{6} \leq x \leq \frac{\pi}{2}}$$
$$\boxed{\frac{5\pi}{6} \leq x \leq \frac{3\pi}{2}}$$