

③ Answer: 3

④ plug-n-pray yields $\frac{0}{1} = 0$

⑤ $\frac{x^2}{\sin^2 3x} = \frac{1}{\textcircled{9}} \cdot \frac{\textcircled{3x}}{\sin 3x} \cdot \frac{\textcircled{3x}}{\sin 3x}$ so $\lim_{x \rightarrow 0} \frac{x^2}{\sin^2 3x} =$
(multiply by $\frac{9}{9}$)

$$\lim_{x \rightarrow 0} \frac{1}{9} \cdot \frac{1}{\lim_{x \rightarrow 0} \left(\frac{\sin 3x}{3x} \right)} \cdot \frac{1}{\lim_{x \rightarrow 0} \left(\frac{\sin 3x}{3x} \right)} = \frac{1}{9} \cdot \frac{1}{1} \cdot \frac{1}{1} = \textcircled{\frac{1}{9}}$$

⑥ Hint: $1 - \cos^2 2x = \sin^2 2x$ by pythagorean identity, then see problem #5. Also try to do this problem by factoring $1 - \cos^2 2x$.

⑦ $\frac{1 - \cos x}{\sin x} = \frac{(1 - \cos x)(1 + \cos x)}{\sin x \cdot (1 + \cos x)} = \frac{1 - \cos^2 x}{\sin x (1 + \cos x)} = \frac{\cancel{\sin x}^{\sin x}}{\cancel{\sin x} (1 + \cos x)} =$

$\frac{\sin x}{1 + \cos x}$ By plug-n-pray: $\lim_{x \rightarrow 0} \frac{\sin x}{1 + \cos x} = \frac{0}{1 + 1} = \frac{0}{2} = 0$

⑧ $\frac{x^2 + 3x}{\sin x} = \frac{x^2}{\sin x} + \frac{3x}{\sin x} = \frac{x}{1} \cdot \left(\frac{x}{\sin x} \right) + \frac{3}{1} \cdot \left(\frac{x}{\sin x} \right)$

so $\lim_{x \rightarrow 0} \frac{x^2 + 3x}{\sin x} = \lim_{x \rightarrow 0} x \cdot \lim_{x \rightarrow 0} \left(\frac{x}{\sin x} \right) + 3 \cdot \lim_{x \rightarrow 0} \left(\frac{x}{\sin x} \right)$
 $0 \cdot 1 + 3 \cdot 1 = \textcircled{3}$

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