5) $F(x) = \int_1^{2x} \sin^2(x) = \sin^2(2x) \cdot 2$

6) $\lim_{x \to 0} \frac{e^x - 1}{\sin(kx)} = \frac{0}{0} \xrightarrow{\text{L'H}} \frac{e^x}{k\cos(kx)} = \boxed{\frac{1}{k}}$

7) $f''(x) = a > 0$

$f'(x) = ax + b$

$f(x) = \frac{a}{2}x^2 + bx + c$

↑ $f(x)$ is a quadratic function

$\lim_{x \to \infty} f(x) = \infty$

8) $y = x^{\tan(2x)}$

$\ln y = \tan(2x) \ln x$

$\frac{1}{y} = 2\sec^2(2x)\ln x + \tan(2x)\left(\frac{1}{x}\right)$

$= 2\sec^2(2x)\ln x + \tan(2x)\left(\frac{1}{x}\right) y$

↳ $= \boxed{2\sec^2(2x)\ln x + \tan(2x)\left(\frac{1}{x}\right) x^{\tan(2x)}}$