Quiz 5

Name: Key Row: ____

[7] **1.** Use L'hopital's rule to find $\lim_{x\to 0} \frac{\ln(\cos x)}{x^2}$.

$\left(\frac{\ln(\cos 0)}{0^2} = \frac{\ln(1)}{0} = \frac{0}{0} \right)$

$= \lim_{x\to 0} \frac{\frac{1}{\cos x}\cdot(-\sin x)}{2x}$ ① ① ①

$= \lim_{x\to 0} \frac{-\tan x}{2x}$ ① $\left(\frac{-\tan 0}{2\cdot 0} = \frac{0}{0} \right)$

$= \lim_{x\to 0} \frac{-\sec^2 x}{2}$ ① ① $= \lim_{x\to 0} \frac{-1}{2\cos^2 x} = \frac{-1}{2(\cos 0)^2} = \boxed{-\frac{1}{2}}$ ①

3. Evaluate the integral, showing all work:

[6] **a.** $\int \frac{1/x}{\sqrt{1-(\ln x)^2}}\,dx$ $= \int \frac{1}{\sqrt{1-u^2}}\,du$ ② $= \arcsin u + C$ ①

$\boxed{\begin{array}{l} u = \ln x \\ du = \frac{1}{x}\,dx \end{array}}$ ① ①

$= \boxed{\arcsin(\ln x) + C}$ ①

[7] **b.** $\int x\sin(3x)\,dx$ $= uv - \int v\,du = x\left(\frac{-\cos(3x)}{3}\right) - \int\left(\frac{-\cos 3x}{3}\right)dx$ ① ①

$\boxed{\begin{array}{ll} u = x & dv = \sin(3x)\,dx \\ du = dx & v = \int \sin(3x)\,dx \\ & v = -\frac{\cos(3x)}{3} \end{array}}$ ① ① ① ①

$= \frac{-x\cos(3x)}{3} + \frac{1}{3}\int \cos(3x)\,dx$

$= \frac{-x\cos(3x)}{3} + \frac{1}{3}\,\frac{\sin(3x)}{3} + C$ ①

$= \boxed{\frac{-x\cos(3x)}{3} + \frac{\sin(3x)}{9} + C}$