Math 222 - Quiz 1 **Section:** ___________ **Name:** ____________________________

Problem 1 Calculate $\int_0^{\pi} \cos^5(2t)\,dt$.

$$\cos^5(2t) = \cos^4(2t)\cos(2t)$$
$$= (1-\sin^2(2t))^2\cos(2t)$$
$$\Rightarrow \int_0^{\pi} \cos^5(2t)\,dt = \int_0^{\pi} (1-\sin^2(2t))^2\cos(2t)\,dt$$

$$u = \sin(2t) \Rightarrow du = 2\cos(2t)\,dt$$
$$\Rightarrow \tfrac{1}{2}du = \cos(2t)\,dt$$

$$= \frac{1}{2}\int (1-u^2)^2\,du$$
$$= \frac{1}{2}u - \frac{1}{3}u^3 + \frac{1}{10}u^5$$
$$= \frac{1}{2}\sin(2t) - \frac{1}{3}\sin^3(2t) + \frac{1}{10}\sin^5(2t)\Big|_0^{\pi}$$
$$= 0 - 0 + 0 = \boxed{0}$$

Problem 2 Calculate $\int \Big(1+\sin(2t)\Big)^2\,dt$.

$$= \int 1 + 2\sin(2t) + \sin^2(2t)\,dt$$
$$= t - \cos(2t) + \int \sin^2(2t)\,dt$$

$$\sin^2(2t) = \frac{1}{2}[1-\cos(4t)]$$
$$\Rightarrow \int \sin^2(2t)\,dt = \frac{1}{2}\int 1-\cos(4t)\,dt$$
$$= \frac{1}{2}t - \frac{1}{8}\sin(4t) + C$$

$$= t - \cos(2t) + \frac{1}{2}t - \frac{1}{8}\sin(4t) + C$$
$$\boxed{= \frac{3}{2}t - \cos(2t) - \frac{1}{8}\sin(4t) + C}$$