MATH 1552 - SPRING 2016
QUIZ 3 - SHOW YOUR WORK

NAME: _____ TA: _____

1. (10 points) $\int x^2 \sin(1-x)\,dx = x^2\cos(1-x) - 2\int x\cos(1-x)\,dx$ see second IBP

$$x^2\cos(1-x) + 2x\sin(1-x) - \cos(1-x) + C$$

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$u = x^2$ $dv = \sin(1-x)\,dx$

$du = 2x\,dx$ $v = \cos(1-x)$

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$$\int x\cos(1-x)\,dx = -x\sin(1-x) + \int \sin(1-x)\,dx = -x\sin(1-x) + \cos(1-x)$$

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$u = x$ $dv = \cos(1-x)$

$du = dx$ $v = -\sin(1-x)$

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2. (10 points) $\int_0^{\frac{\pi}{2}} \sqrt{1-\cos(4x)}\,dx = -\frac{\sqrt{2}}{2}\left(\cos(2x)\Big|\right) = -\frac{\sqrt{2}}{2}\left(\cos(\pi)-\cos(0)\right)$

$$= -\frac{\sqrt{2}}{2}\left(\cos(\pi)-\cos(0)\right) = -\frac{\sqrt{2}}{2}(-1-1) = \sqrt{2}$$

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$$\sin^2(2x) = \frac{1-\cos(4x)}{2} \Rightarrow \sqrt{1-\cos(4x)} = \sqrt{2}\sin(2x)$$

$$\Rightarrow \int \sqrt{1-\cos(4x)}\,dx = \sqrt{2}\int \sin(2x)\,dx = -\frac{\sqrt{2}}{2}\cos(2x)$$

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3. (10 points) $\int \mathbf{sin^3(3x)\,cos^4(3x)}\,\boldsymbol{dx} = \int \sin^2(3x)\cos^4(3x)\sin(3x)\,dx$

$$= \int \left(1-\cos^2(3x)\right)\cos^4(3x)\sin(3x)\,dx$$

$$= \int \left(\cos^4(3x)-\cos^6(3x)\right)\sin(3x)\,dx$$

$$\left(let\ u=\cos(3x)\ \Rightarrow\ -\frac{1}{3}\,du=\sin(3x)\,dx\right)$$

$$\mathbf{= -\frac{1}{3}\int \left(u^4-u^6\right)du = -\frac{1}{3}\left(\frac{\cos^5(3x)}{5}-\frac{\cos^7(3x)}{7}\right)+C}$$