Name: _____ Date: _____ Period: _____ 2016

AP Calculus – Quiz: Integration, U-Substitution, and Integration by Parts

1. $\int (5x^2 + \cos x \sin x)\, dx$

$\frac{5x^3}{3} + \frac{\sin^2 x}{2} + C$

3. $\int \frac{4^x}{\ln 16} dx$

$\frac{4^x}{\ln 4 \cdot \ln 16} + C$

2. $\int \frac{16}{x\sqrt{(4x)^2 - 1}} dx$

$u = 4x \qquad x = u/4$

$du = 4\,dx$

$4\int \frac{du}{x\sqrt{u^2 - 1}}$

$16\int \frac{du}{u\sqrt{u^2 - 1}}$

$16 \sec^{-1}(4x) + C$

4. $\int \frac{x^2 + 3x}{x} dx$

$\int (x + 3)\, dx$

$\frac{x^2}{2} + 3x + C$

5. $\int \cos^2\left(\frac{x}{3}\right) dx$

$\cos(2\theta) + 1 = \cos^2(\theta)$

$\int \frac{1 + \cos\left(\frac{2x}{3}\right)}{2} dx$

$\frac{x}{2} + \frac{3}{4}\sin\left(\frac{2x}{3}\right) + C$

7. $\int \sqrt{x+1}\,(3x+4)\, dx$

$u = x + 1$

$x = u - 1$

$du = dx$

$\int u^{\frac{1}{2}}\left(3(u-1)+4\right) du$

$\int \left(3u^{\frac{3}{2}} + u^{\frac{1}{2}}\right) du$

$\frac{6}{5}(x+1)^{\frac{5}{2}} + \frac{2}{3}(x+1)^{\frac{3}{2}} + C$

150 - 140

216 - 168

6. $\int_5^6 \frac{3x-7}{(6x^2-28x)^2} dx$

$u = 6x^2 - 28x$

$du = (12x - 28)\, dx$

$\frac{1}{4} du = (3x - 7)\, dx$

$\frac{1}{4}\int_{10}^{48} \frac{du}{u^2}$

$-\frac{1}{4u}\Big|_{10}^{48} = -\frac{1}{4}\left(\frac{1}{48} - \frac{1}{10}\right)$

$= \frac{-1}{4}\left(\frac{10 - 48}{480}\right)$

$\frac{19}{960}$

8. $\int (3x+1)^2 e^{3x} dx$

$(3x+1)^2$	e^{3x}
$2 \cdot 3(3x+1)$	$\frac{e^{3x}}{3}$
$2 \cdot 3 \cdot 3$	$\frac{e^{3x}}{3 \cdot 3}$
0	$\frac{e^{3x}}{3 \cdot 3 \cdot 3}$

$\frac{e^{3x}(3x^2+1)^2}{3} - \frac{2e^{3x}(3x+1)}{3} + \frac{2e^{3x}}{3} + C$