MATH 1310: CLS Final exam review: more substitution

Use substitution to evaluate each of the following indefinite and definite integrals. The answers are given, so that you can check your work, but you need to show all of the steps leading up to the answer. And you need to express your answers in the given form.

1. $\displaystyle\int_0^{\pi/2} \sin(x)\cos(x)\sqrt{9\sin^2(x)+16}\,dx$ $\left(\text{ANSWER: } \dfrac{61}{27}\right)$

2. $\displaystyle\int x^2(x^3-5)^2\,dx$ $\left(\text{ANSWER: } \dfrac{(x^3-5)^3}{9}+C\right)$

3. $\displaystyle\int t^4\cos(t^5+1)\,dt$ $\left(\text{ANSWER: } \dfrac{\sin(t^5+1)}{5}+C\right)$

4. $\displaystyle\int_3^5 \frac{x}{\sqrt{x^2-5}}\,dx$ $\left(\text{ANSWER: } \sqrt{20}-2\right)$

5. $\displaystyle\int_0^{\pi/2} \sin(\pi\cos x)\sin x\,dx$ $\left(\text{ANSWER: } \dfrac{2}{\pi}\right)$

6. $\displaystyle\int \frac{2y\ln(1+y^2)}{1+y^2}\,dy$ $\left(\text{ANSWER: } \dfrac{1}{2}(\ln(1+y^2))^2+C\right)$

7. $\displaystyle\int_0^1 5^{5^z}5^z\,dz$ $\left(\text{ANSWER: } \dfrac{3120}{\ln^2(5)}\right)$

8. $\displaystyle\int 5^{5^x}5^x\,dx$ $\left(\text{ANSWER: } \dfrac{5^{5^x}}{(\ln 5)^2}+C\right)$

9. $\displaystyle\int_0^1 \frac{x^2}{(x^3+1)^3}\,dx$ $\left(\text{ANSWER: } \dfrac{1}{8}\right)$

10. $\displaystyle\int \frac{\ln y}{y}\,dy$ $\left(\text{ANSWER: } \dfrac{1}{2}(\ln y)^2+C\right)$

11. $\displaystyle\int \frac{e^{\sqrt{\ln x}}}{x\sqrt{\ln x}}\,dx$ $\left(\text{ANSWER: } 2e^{\sqrt{\ln x}}+C\right)$

12. $\displaystyle\int_0^1 \frac{\sin(\arctan(q))}{1+q^2}\,dq$ $\left(\text{ANSWER: } 1-\dfrac{1}{\sqrt{2}}\right)$