Circle your Instructor: Faudree, Williams, Zirbes ________ / 15

Name: ______________________________

This is a 30 minute quiz. There are 15 problems. Books, notes, calculators or any other aids are prohibited. Calculators and notes are not allowed. **Your answers should be simplified unless otherwise stated.** You should use correct notation including the correct use of equal signs and integration symbols. There is no partial credit. If you have any questions, please raise your hand.

Circle your final answer.

Evaluate the integral, if it exists.

1. $\int (x^\pi - e^2)\,dx$ $= \boxed{\dfrac{x^{\pi+1}}{\pi+1} - e^2 x + C}$

2. $\int \frac{1}{(7x)^2} - \frac{8x}{3} + 1)\,dx$ $= \int\left(\frac{1}{49}x^{-2} - \frac{8}{3}x + 1\right)dx = \boxed{-\frac{1}{49}x^{-1} - \frac{4}{3}x^2 + x + C}$

3. $\int_0^1 e^x - x^{2/3}\,dx$ $= e^x - \frac{3}{5}x^{5/3}\Big]_0^1 = \left(e^1 - \frac{3}{5}\right) - \left(e^0 - 0\right) = e - \frac{3}{5} - 1 = \boxed{e - \frac{8}{5}}$

4. $\int_0^1 \sin(\pi x)\,dx$ $= \int_0^\pi \frac{1}{\pi}\sin u\,du = -\frac{1}{\pi}\cos u\Big|_0^\pi = -\frac{1}{\pi}(\cos\pi - \cos 0) = -\frac{1}{\pi}(-1-1) = \boxed{\frac{2}{\pi}}$

let $u = \pi x$.
$du = \pi\,dx$. So $\frac{1}{\pi}du = dx$.
If: $x=0,\ u=0$
$x=1,\ u=\pi$.

5. $\int_0^1 (1-x)^9\,dx$ $= \int_1^0 -u^9\,du = \frac{-1}{10}u^{10}\Big|_1^0 = -\frac{1}{10}(0^{10} - 1^{10}) = \frac{1}{10}$

let $u = 1-x$
So $du = -1\cdot dx$ or $-du = dx$.
If: $x=0,\ u=1$
$x=1,\ u=0$.

6. $\int e^{5r}\,dr$ $= \frac{1}{5}\int e^{u}\,du = \frac{1}{5}e^{u} + C = \boxed{\frac{1}{5}e^{5r} + C}$

let $u = 5r$
$du = 5\,dr$
$\frac{1}{5}du = dr$

7. $\int \frac{x}{1+x^2}\,dx$ $= \frac{1}{2}\int \frac{du}{u} = \frac{1}{2}\ln|u| + C = \boxed{\frac{1}{2}\ln|1+x^2| + C}$

let $u = 1+x^2$
$du = 2x\,dx$
$\frac{1}{2}du = x\,dx$

Note absolute value bars are unnecessary here.

8. $\int \tan^4 x \sec^2 x\,dx$ $= \int u^4\,du = \frac{1}{5}u^5 + C = \boxed{\frac{1}{5}\tan^5 x + C}$

let $u = \tan x$
$du = \sec^2 x\,dx$

9. $\int \csc^2 x\,dx$ $= \boxed{-\cot x + C}$

10. $\int \frac{(\arctan x)^3}{1+x^2}\,dx$ $= \int u^3\,du = \frac{1}{4}u^4 + C = \boxed{\frac{1}{4}(\arctan x)^4 + C}$

let $u = \arctan x$
$du = \frac{1}{1+x^2}\,dx$

11. $\int \frac{x}{\sqrt{1-x^4}} dx =$ $\int \frac{x\,dx}{\sqrt{1-(x^2)^2}} = \frac{1}{2}\int \frac{du}{\sqrt{1-u^2}} = \frac{1}{2}\arcsin u + C$

Let $u = x^2$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$= \boxed{\frac{1}{2}\arcsin(x^2) + C}$

12. $\int \frac{1+x}{\sqrt{x^2+2x+3}} dx = \frac{1}{2}\int \frac{du}{\sqrt{u}} = \frac{1}{2}\int u^{-1/2} du = \frac{1}{2}\cdot 2 \cdot u^{1/2} + C$

let $u = x^2+2x+3$

$du = (2x+2)dx$

$\frac{1}{2}du = (x+1)dx$

$= \boxed{\sqrt{x^2+2x+3} + C}$

13. $\int e^x \sin(e^x)\, dx =$ $\int \sin u \cdot du = -\cos u + C$

let

$u = e^x$

$du = e^x dx$

$= \boxed{-\cos(e^x) + C}$

14. $\int \frac{e^{x^{1/3}}}{x^{2/3}} dx$ $= 3\int e^u \cdot du = 3e^u + C = 3e^{x^{1/3}} + C$

let $u = x^{1/3}$

$du = \frac{1}{3}x^{-2/3} dx$

$3\,du = x^{-2/3} dx$

15. $\int \frac{\sec^2\theta}{2+\tan\theta} d\theta$ $= \int \frac{du}{u} = \ln|u| + C = \boxed{\ln|2+\tan\theta| + C}$

Let $u = 2+\tan\theta$

$du = \sec^2\theta\, d\theta$