

(2) $\frac{1}{x^3 \cdot \sqrt{x}}$

KEY

Quiz Review

Evaluate the Integrals:

$u = x-1$
 $du = dx$

$\frac{1}{x^3 \cdot x^{1/2}} = \frac{1}{x^{7/2}} = x^{-7/2}$

$u = 1-x$
 $du = -dx$

1. $\int (x-1)^{243} dx$
 $\int u^{243} du = \frac{u^{244}}{244} + C$
 $= \frac{(x-1)^{244}}{244} + C$

2. $\int \frac{1}{x^2 \sqrt{x}} dx$
 $\int x^{-7/2} dx = \frac{-2x^{-5/2}}{5} + C$

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

4. $\int x\sqrt{2x^2-1} dx$
 $u = 2x^2-1$
 $du = 4x dx$
 $\frac{1}{4} du = x dx$
 $\frac{1}{4} \int u^{1/2} du = \frac{1}{4} \cdot \frac{2}{3} u^{3/2} + C = \frac{1}{6} u^{3/2} + C$
 $= \frac{1}{6} (2x^2-1)^{3/2} + C$

5. $\int (1+x^3)^{3x^2} dx$
 $u = 1+x^3$
 $du = 3x^2 dx$
 $\int u du = \frac{u^2}{2} + C$
 $= \frac{(1+x^3)^2}{2} + C$

6. $\int \frac{x^3-8}{x-2} dx$
 $(x-2)(x^2+2x+4)$
 $\int (x^2+2x+4) dx = \frac{x^3}{3} + x^2 + 4x + C$

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

8. $\int \frac{8}{\sec x} dx$
 $\int 8 \cos x dx = 8 \sin x + C$

9. $\int 2xe^{x^2} dx$
 $u = x^2$
 $du = 2x dx$
 $\int e^u du = e^u + C = e^{x^2} + C$

10. $\int \frac{\sin x}{\cos^2 x} dx$
 $\int \frac{\sin x}{\cos x} \cdot \frac{1}{\cos x} dx$
 $\int \tan x \sec x dx = \sec x + C$

11. $f(x) = 4\sqrt{x}$ from $[0, 3]$
 $\frac{1}{3} \int_0^3 4x^{1/2} dx = \frac{4}{3} \cdot \frac{2}{3} x^{3/2} \Big|_0^3$
 $= \frac{8}{9} x^{3/2} \Big|_0^3 = \frac{8}{9} \cdot 3^{3/2}$
 $= \frac{8\sqrt{27}}{9} = \frac{8 \cdot 3\sqrt{3}}{9} = \frac{8\sqrt{3}}{3}$

12. $f(x) = x^2 - 8x - 17$ on $[-5, -3]$
Find the value of c that satisfies the MVT for Integrals
 -3.423
 -4.577

13. $\int_1^3 \frac{3}{3x-2} dx$
 $u = 3x-2$
 $du = 3 dx$
 $u(1) = 1$
 $u(3) = 7$
 $\int_1^7 \frac{1}{u} du = \ln|u| \Big|_1^7 = \ln 7 - \ln 1 = \ln 7$

14. $\int_0^{\pi/4} \tan x \sec^2 x dx$
 $u = \tan x$
 $du = \sec^2 x dx$
 $u(0) = \tan 0 = 0$
 $u(\pi/4) = \tan \pi/4 = 1$
 $\int_0^1 u du = \frac{u^2}{2} \Big|_0^1 = \frac{1}{2}$

16. $\int_1^2 \frac{2 \ln x}{x} dx$
 $u = \ln x$
 $du = \frac{1}{x} dx$
 $u(1) = 0$
 $u(2) = \ln 2$
 $\int_0^{\ln 2} 2u du = \frac{2}{2} u^2 \Big|_0^{\ln 2} = (\ln 2)^2$

17. $\int_1^4 \frac{e^{\sqrt{x}}}{2\sqrt{x}} dx$
 $u = \sqrt{x}$
 $du = \frac{1}{2\sqrt{x}} dx$
 $u(1) = 1$
 $u(4) = 2$
 $\int_1^2 e^u du = e^u \Big|_1^2 = e^2 - e$

$\int_0^{\pi/2} \sin^2 x \cos x dx$
 $u = \sin x$
 $du = \cos x dx$
 $u(0) = 0$
 $u(\pi/2) = 1$
 $\int_0^1 u^2 du = \frac{1}{3} u^3 \Big|_0^1 = \frac{1}{3}$