

\*NO CALCULATOR\*

Honor Pledge:

#1 - 2. Multiple Choice. Choose the best response for each question.

3. 1. If the substitution  $u = \frac{x}{2}$  is made, the integral  $\int_2^4 \frac{1 - (\frac{x}{2})^2}{x} dx =$

a)  $\int_1^2 \frac{1-u^2}{u} du$

b)  $\int_2^4 \frac{1-u^2}{u} du$

c)  $\int_1^2 \frac{1-u^2}{2u} du$

d)  $\int_1^2 \frac{1-u^2}{4u} du$

e)  $\int_2^4 \frac{1-u^2}{2u} du$

$u = \frac{x}{2} \quad x = 2u$   
 $du = \frac{1}{2} dx \quad dx = 2 du$   
 $x=2 \quad | \quad x=4$   
 $u = \frac{2}{2} \quad | \quad u = \frac{4}{2}$   
 $u=1 \quad | \quad u=2$   
 $\int_1^2 \frac{1-u^2}{2u} \cdot 2 du$

2. Evaluate:  $\int_1^6 (\frac{1}{x} + 2x) dx$

a)  $\ln 6 + 35$

b)  $\ln 6 + 37$

c)  $\ln 5 + 35$

d)  $\ln 5 + 37$

e) 3

$\ln|x| + 2 \cdot \frac{x^2}{2} \Big|_1^6 = \ln 6 + 6^2 - (\ln 1 + 1^2)$

Free Response. Show your work. Please box or circle your final answer.

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

$\int (x^2 - 3x + 1) dx$

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

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

4.  $\int e^{5x} dx$

$u = 5x$

$\frac{1}{5} \int 5 dx \cdot e^{5x}$

$du = 5 dx$

$\frac{1}{5} \int e^u du$

$\frac{1}{5} e^u + C = \frac{1}{5} e^{5x} + C$

missing  $\frac{1}{5}$

$\ln 6 + 36 - (0 + 1)$   
 $\ln 6 + 36 - 1$   
 $\ln 6 + 35$

5.  $\int \frac{x}{(1-x^2)^3} dx$

$\int x(1-x^2)^{-3} dx$

$u = 1-x^2$

$du = -2x dx$

$-\frac{1}{2} \int -2x dx (1-x^2)^{-3}$

$-\frac{1}{2} \int u^{-3} du$

$\frac{1}{4(1-x^2)^2} + C$

$-\frac{1}{2} (\frac{u^{-2}}{-2}) + C = \frac{1}{4} u^{-2} + C$

$\frac{1}{4} (1-x^2)^{-2} + C$

6.  $\int \frac{\ln^4 x}{x} dx = \int (\ln x)^4 \cdot \frac{1}{x} dx$

$u = \ln x$

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

$\int u^4 du$

$\frac{u^5}{5} + C$

$\frac{1}{5} \ln^5 x + C$

5 7.  $\int x(\sqrt{x} + 2) dx$

$$\int (x^{\frac{3}{2}} + 2x) dx$$

$$\frac{2}{5} \cdot x^{\frac{5}{2}} + 2\left(\frac{x^2}{2}\right) + C$$

$$\boxed{\frac{2}{5}x^{\frac{5}{2}} + x^2 + C}$$

5 8.  $\int \sin(2x) \cos(2x) dx$   $u = \sin(2x)$   
 $du = \cos(2x) \cdot 2 dx$

$$\frac{1}{2} \int \underline{2 \cos(2x)} \sin(2x) dx$$

$$\frac{1}{2} \int u du$$

$$\frac{1}{2} \left(\frac{u^2}{2}\right) + C = \frac{1}{4} u^2 + C = \boxed{\frac{1}{4} \sin^2(2x) + C}$$

5 9.  $\int \frac{x}{\sqrt{3x^2-1}} dx$   $u = 3x^2 - 1$   
 $du = 6x dx$

$$\frac{1}{6} \int \underline{6x} (3x^2-1)^{-\frac{1}{2}} dx$$

$$\frac{1}{6} \int u^{-\frac{1}{2}} du$$

$$\frac{1}{6} \cdot 2 u^{\frac{1}{2}} + C = \frac{1}{3} u^{\frac{1}{2}} + C$$

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

$$\boxed{\frac{1}{3} \sqrt{3x^2-1} + C}$$

10. Rewrite as a function of u. Do NOT Evaluate.

8  $\int_{-1}^2 2x(3x^2-2)^3 dx$   $u = 3x^2 - 2$   
 $du = 6x dx$

$$\frac{1}{3} \int \underline{3 \cdot 2x} (3x^2-2)^3 dx$$

$$\frac{1}{3} \int_1^{10} u^3 du$$

$$\int_1^{10} \frac{1}{3} u^3 du$$

$x = -1 \mid x = 2$   
 $u = 3(-1)^2 - 2 \mid 3(2)^2 - 2$   
 $u = 1 \mid u = 10$

7 11.  $\int_0^4 (x^3 - 2) dx$

4  $\left[ \frac{x^4}{4} - 2x \right]_0^4$

2  $\frac{4^4}{4} - 2(4) - \left[ \frac{0^4}{4} - 2(0) \right]$

$4^3 - 8$

$64 - 8$

1  $\boxed{56}$

12.  $\int_0^1 \frac{1}{1+x} dx$   $u = 1+x$   
 $du = 1 dx$

$$\int_1^2 \frac{1}{u} du$$

$$\ln|u| \Big|_1^2$$

$$\ln 2 - \ln 1$$

$$\boxed{\ln 2}$$

$x = 0 \mid x = 1$   
 $u = 1 \mid u = 1+1$   
 $u = 2$

$\int_0^1 \frac{1}{1+x^2} dx$

$$\tan^{-1} x \Big|_0^1$$

$$\tan^{-1}(1) - \tan^{-1}(0)$$

$$\frac{\pi}{4} - 0 = \boxed{\frac{\pi}{4}}$$

7 13.  $\int_{-\pi/4}^{\pi/4} \sec^2 x dx$

5  $\left[ \tan x \right]_{-\pi/4}^{\pi/4}$

$\tan \frac{\pi}{4} - \tan(-\frac{\pi}{4})$

3  $1 - (-1)$

$1 + 1 = \boxed{2}$

8 14.  $\int_{-2}^1 |3x+3| dx$   $3x+3 \geq 0$   
 $3x \geq -3$   
 $x \geq -1$

3  $\int_{-2}^{-1} (-3x-3) dx + \int_{-1}^1 (3x+3) dx$

2  $\left[ -\frac{3}{2} \left(\frac{x^2}{2}\right) - 3x \right]_{-2}^{-1} + \left[ \frac{3}{2} \left(\frac{x^2}{2}\right) + 3x \right]_{-1}^1$

$-\frac{3}{2} \left(\frac{1^2}{2}\right) - 3(1) - \left(-\frac{3}{2} \left(\frac{-2^2}{2}\right) - 3(-2)\right) + \left[\frac{3}{2} \left(\frac{1^2}{2}\right) + 3(1)\right] - \left(\frac{3}{2} \left(\frac{-1^2}{2}\right) + 3(-1)\right)$

$-\frac{3}{2} + 3 + 6 - 6 + \frac{3}{2} + 3 - \frac{3}{2} + 3$

1  $\boxed{\frac{15}{2}}$  7.5