

Name: Solutions

Section: \_\_\_\_\_

You have 10 minutes to complete the following problems, without using your notes, book, or calculator.

Evaluate the indefinite integrals:

1.  $\int 2x\sqrt[3]{x^2+1} dx$       $u = x^2 + 1$       $du = 2x dx$

$$\int \sqrt[3]{u} du = \int u^{1/3} du = \frac{3}{4} u^{4/3} + C = \frac{3}{4} (x^2+1)^{4/3} + C \quad \overline{2}$$

$$\hookrightarrow = \boxed{\frac{3}{4} \sqrt[3]{(x^2+1)^4} + C}$$

2.  $\int t^4 \sin(t^5) dt$       $u = t^5$       $du = 5t^4 dt$

$$\frac{1}{5} \int \sin(t^5) (5t^4 dt) = \frac{1}{5} \int \sin u du = \frac{1}{5} (-\cos u) + C \quad \overline{2}$$

$$\hookrightarrow = \boxed{-\frac{1}{5} \cos(t^5) + C}$$

3.  $\int \cos^3 \theta \sin \theta d\theta = \int (\cos \theta)^3 \sin \theta d\theta$      ( $u = \cos \theta$       $du = -\sin \theta d\theta$ )

$$= - \int (\cos \theta)^3 (-\sin \theta) d\theta = - \int u^3 du = -\frac{1}{4} u^4 + C = 2$$

$$= \boxed{-\frac{1}{4} \cos^4 \theta + C}$$

4.  $\int \frac{w}{1-w} dw$       $u = 1-w$       $du = -dw$

$$w = 1-u \leftarrow \underline{\text{Trick!}}$$

$$- \int \frac{w}{1-w} (-dw) = - \int \frac{1-u}{u} du = \int \frac{u-1}{u} du = \int 1 - \frac{1}{u} du = 2$$

$$\hookrightarrow = u - \ln|u| + C = \underbrace{(1-w)}_{\text{constant}} - \ln|1-w| + C = \boxed{-w - \ln|1-w| + C}$$