I-A1 NAME:

Evaluate each indefinite integral. Simplify answers ~~when necessary~~.

1. $\int \csc^2\theta \, d\theta$

$$\frac{d}{dx}\tan x = \sec^2(x) \qquad \tan \underset{\text{integral}}{\overset{\text{deriv}}{\rightleftharpoons}} \sec^2$$

$$\frac{d}{dx}\cot x = \csc^2(x)$$

$$= \int \csc^2\theta \, d\theta$$

$$= \boxed{-\cot\theta + C}$$

2. $\int (2x^2+1)^2 dx$ FOIL

$$\int (2x^2+1)(2x^2+1)\,dx = \int 4x^4 + 2x^2 + 2x^2 + 1 \, dx = \int 4x^4 + 4x^2 + 1 \, dx$$

rev. power

$$\boxed{\frac{4}{5}x^5 + \frac{4}{3}x^3 + x + C}$$

3. $\int \frac{4\sqrt{x}-6x}{\sqrt{x}} dx$ rewrite

$$\int \frac{4\sqrt{x}}{\sqrt{x}} - \frac{6x}{x^{1/2}} \, dx \qquad \frac{x^a}{x^b} = x^{a-b}$$

$$\int 4 - 6x^{1/2} \, dx$$

$$= 4x - 6 \cdot \frac{x^{3/2}}{3/2} + C \rightarrow 4x - 6 \cdot \frac{2}{3} x^{3/2} + C$$

$$4x - 12x^{3/2} + C$$

4. $\int \frac{x^2+x-6}{x+3} dx$ $\boxed{\text{Factor!}}$

$$\int \frac{\cancel{(x+3)}(x-2)}{\cancel{x+3}} \, dx$$

$$\int x - 2 \, dx = \frac{1}{2}x^2 - 2x + C$$

rev. power rule

5. $\int \cancel{2\tan x} \, dx$

$$\frac{d}{dx}\cos x = -\sin(x)$$

$$\int -\sin(x) = \cos(x) + C$$

$$\int 2 \sin x \, dx$$

$$2\int \sin x \, dx$$

$$-2\cos(x) + C$$

I-A2b

6. Evaluate the indefinite integral $\int 3x\sqrt[3]{x+2}\,dx$.

$\int 3x(x+2)^{1/3}\,dx$

Need: 1 !! → Let $\boxed{u = x+2}$

$\boxed{u-2=x}$

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

$\boxed{du = dx}$

"x" "dx"

$\int 3(u-2)(u)^{1/3}\,du$

$\int (3u-6)u^{1/3}\,du$

$\int 3u^{4/3} - 6u^{1/3}\,du$ rev. power rule

$3\cdot\frac{3}{7}u^{7/3} - 6\cdot\frac{3}{4}u^{4/3} + C$

$\frac{9}{7}u^{7/3} - \frac{9}{2}u^{4/3} + C \longrightarrow \underline{\frac{9}{7}(x+2)^{7/3} - \frac{9}{2}(x+2)^{4/3} + C}$

I-A3 [try it out??]

7. The velocity, in meters per second, of a moving body can be modeled by the differentiable function $v(t) = 3t - 2$. Find the position of the body at t=5 seconds if at t=0, the position was -4 meters.

$p(5)=?$ $p(0)=-4$

$p' = v(t) = 3t-2$

$\frac{dp}{dt} = 3t-2$

$dp = 3t-2\,dt$

$\int dp = \int 3t-2\,dt$

$p(t) = \frac{3}{2}t^2 - 2t + C \rightarrow p(0) = -4 = \frac{3}{2}(0)^2 - 2(0) + C \rightarrow \underline{p(t) = \frac{3}{2}t^2 - 2t - 4}$

plug in $(0,-4)$ $-4 = C$

$p(5)$?

$\frac{3}{2}(25) - 2(5) - 4$

$= 23.5$ meters