## Lesson Practice 23A

1. Let $u = 2 + X$; $\frac{du}{dX} = 1$; $du = dX$

$$\int (2+X)^4 dX = \int u^4 du$$
$$= \frac{u^5}{5} + C$$
$$= \frac{1}{5}(2+X)^5 + C$$

Check :

$$\frac{d}{dX}\left(\frac{1}{5}(2+X)^5\right) = \frac{1}{5}\cdot 5(2+X)^4$$
$$= (2+X)^4$$

2. Let $u = t + 1$; $\frac{du}{dt} = 1$

$$\int \frac{dt}{\sqrt{t+1}} = \int \frac{du}{\sqrt{u}}$$
$$= \int u^{-\frac{1}{2}} du$$
$$= \frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= 2\sqrt{u} + C$$
$$= 2\sqrt{t+1} + C$$

Check :

$$\frac{d}{dt}\left(2\sqrt{t+1}\right) = 2\cdot\frac{1}{2}(t+1)^{-\frac{1}{2}}$$
$$= \frac{1}{\sqrt{t+1}}$$

3. Let $u = 3 + X^2$; $\frac{du}{dX} = 2X$; $du = 2Xdx$

$$\int \left(3+X^2\right)^{10} 2XdX = \int u^{10} du$$
$$= \frac{u^{11}}{11} + C$$
$$= \frac{1}{11}\left(3+X^2\right)^{11} + C$$

Check :

$$\frac{d}{dX}\left(\frac{1}{11}\left(3+X^2\right)^{11}\right) = \frac{1}{11}\cdot 11\left(3+X^2\right)^{11}\cdot 2X$$
$$= 2X\left(3+X^2\right)^{10}$$

4. Let $u = 4X$; $\frac{du}{dX} = 4$; $du = 4dX$

$$\int \csc^2(4X)\cdot 4dX = \int \csc^2(u)\ du$$
$$= -\cot(u) + C$$
$$= -\cot(4X) + C$$

Check :

$$\frac{d}{dX}\left(-\cot(4X)\right) = -\left(-\csc^2(4X)\cdot 4\right)$$
$$= 4\csc^2(4X)$$

5. Let $u = \sin(3\theta)$; $\frac{du}{d\theta} = \cos(3\theta)\cdot 3$;
$du = \cos(3\theta)\cdot 3(d\theta)$

$$\int \sin^3(3\theta)\cos(3\theta)\,d\theta = \frac{1}{3}\int \sin^3(3\theta)\cos(3\theta)\,d\theta\cdot 3$$
$$= \frac{1}{3}\int u^3\,du$$
$$= \frac{1}{3}\frac{u^4}{4} + C$$
$$= \frac{1}{12}u^4 + C$$
$$= \frac{1}{12}(\sin(3\theta))^4 + C$$

Check:

$$\frac{d}{d\theta}\left(\frac{1}{12}\sin(3\theta)\right)^4 = \frac{1}{12}\cdot 4(\sin(3\theta))^3\cdot\cos(3\theta)\cdot 3$$
$$= (\sin(3\theta))^3\cos(3\theta)$$

6. Let $u = a - Y$; $\frac{du}{dY} = -1$; $du = -dY$

$$\int\frac{dY}{(a-Y)^2} = -\int\frac{-dY}{(a-Y)^2}$$
$$= -\int\frac{du}{u^2}$$
$$= -\int u^{-2}du$$
$$= -\frac{u^{-1}}{-1} + C$$
$$= \frac{1}{a-Y} + C$$

Check:

$$\frac{d}{dY}\left(\frac{1}{a-Y}\right) = \frac{d}{dY}(a-Y)^{-1}$$
$$= -(a-Y)^{-2}(-1)$$
$$= \frac{1}{(a-Y)^2}$$

7. Let $u = 4X$; $\frac{du}{dX} = 4$; $du = 4dX$

$$\int e^{4X}\,dX = \frac{1}{4}\int e^{4X}dX\cdot 4$$
$$= \frac{1}{4}\int e^u du$$
$$= \frac{1}{4}e^u + C$$
$$= \frac{1}{4}e^{4X} + C$$

Check:

$$\frac{d}{dX}\left(\frac{1}{4}e^{4X}\right) = \frac{1}{4}e^{4X}\cdot 4$$
$$= e^{4X}$$

8. Let $u = 1 + e^X$; $\frac{du}{dX} = e^X$; $du = e^X dX$

$$\int e^X(1+e^X)^8\,dX = \int u^8 du$$
$$= \frac{u^9}{9} + C$$
$$= \frac{1}{9}(1+e^X)^9 + C$$

Check:

$$\frac{d}{dX}\left[\left(\frac{1}{9}\cdot 1 + e^X\right)^9\right] = \frac{1}{9}\cdot 9(1+e^X)^8\cdot e^X$$
$$= e^X(1+e^X)^8$$

9. Let $u = \ln(X);\ \frac{du}{dX} = \frac{1}{X};\ du = \frac{dX}{X}$

$$\int \frac{\ln(X))^2}{X} dX = \int u^2 du$$
$$= \frac{u^3}{3} + C$$
$$= \frac{1}{3}(\ln(X))^3 + C$$

Check :

$$\frac{d}{dX}\left(\frac{1}{3}(\ln(X))^3\right) = \frac{1}{3}\cdot 3(\ln(X))^2 \cdot \frac{1}{X}$$
$$= \frac{\ln^2(X)}{X}$$

10. Let $u = 2t + 1\ ;\ \frac{du}{dt} = 2\ ;\ du = 2dt$

$$\int \frac{3dt}{\sqrt{2t+1}} = \frac{1}{2}\cdot 3\int \frac{dt}{\sqrt{2t+1}}\cdot 2$$
$$= \frac{3}{2}\int \frac{du}{\sqrt{u}}$$
$$= \frac{3}{2}\int u^{-\frac{1}{2}} du$$
$$= \frac{3}{2}\frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= 3\sqrt{u} + C$$
$$= 3\sqrt{2t+1} + C$$

Check :

$$\frac{d}{dt}\left(3\sqrt{2t+1}\right) = 3\cdot\frac{1}{2}(2t+1)^{-\frac{1}{2}}\cdot 2$$
$$= \frac{3}{\sqrt{2t+1}}$$

## Lesson Practice 23B

1. Let $u = X - 3\ ;\ \frac{dY}{dX} = 1$

$$\int (X-3)^{21} dX = \int u^{21} du$$
$$= \frac{u^{22}}{22} + C$$
$$= \frac{1}{22}(X-3)^{22} + C$$

Check :

$$\frac{d}{dX}\left(\frac{1}{22}(X-3)^{22}\right) = \frac{1}{22}\cdot 22(X-3)^{21}$$
$$= (X-3)^{21}$$

2. Let $u = 2X^2 + 1;\ \frac{du}{dX} = 4X;\ du = 4XdX$

$$\frac{1}{4}\int X\sqrt{2X^2+1}\ dX\cdot 4 = \frac{1}{4}\int \sqrt{u}\ du$$
$$= \frac{1}{4}\int u^{\frac{1}{2}} du$$
$$= \frac{1}{4}\frac{u^{\frac{3}{2}}}{\frac{3}{2}} + C$$
$$= \frac{1}{6}\left(2X^2+1\right)^{\frac{3}{2}} + C$$

Check :

$$\frac{d}{dX}\left(\frac{1}{6}\left(2X^2+1\right)^{\frac{3}{2}}\right) = \frac{1}{6}\cdot\frac{3}{2}\left(2X^2+1\right)^{\frac{1}{2}}\cdot 4X$$
$$= X\sqrt{2X^2+1}$$

3. Let $u = 1 - X^3$; $\frac{du}{dX} = -3X^2$; $du = -3X^2 dX$

$$-\frac{1}{3}\int \frac{X^2}{\sqrt{1-X^3}}dX(-3) = -\frac{1}{3}\int \frac{du}{\sqrt{u}}$$
$$= -\frac{1}{3}\int u^{-\frac{1}{2}}du$$
$$= -\frac{1}{3}\frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= -\frac{2}{3}\sqrt{u} + C$$
$$= -\frac{2}{3}\sqrt{1-X^3} + C$$

Check:

$$\frac{d}{dX}\left(-\frac{2}{3}\sqrt{1-X^3}\right) = -\frac{2}{3}\cdot\frac{1}{2}\left(1-X^3\right)^{-\frac{1}{2}}\left(-3X^2\right)$$
$$= \frac{X^2}{\sqrt{1-X^3}}$$

4. Let $u = 1 + X^3$; $\frac{du}{dX} = 3X^2$; $du = 3X^2 dX$

$$\int (1+X^3)^3 \cdot 3X^2\,dX = \int u^3\,du$$
$$= \frac{u^4}{4} + C$$
$$= \frac{1}{4}(1+X^3)^4 + C$$

Check:

$$\frac{d}{dX}\left(\frac{1}{4}\left(1+X^3\right)^4 + C\right) = \frac{1}{4}\cdot 4\left(1+X^3\right)^3\left(3X^2\right)$$
$$= 3X^2\left(1+X^3\right)^3$$

5. Let $u = 2X - 3$; $\frac{du}{dX} = 2$; $du = 2dX$

$$\frac{1}{2}\int \cos(2X-3)dX \cdot 2 = \frac{1}{2}\int \cos(u(du))$$
$$= \frac{1}{2}\sin(u) + C$$
$$= \frac{1}{2}\sin(2X-3) + C$$

Check:

$$\frac{d}{dX}\left(\frac{1}{2}\sin(2X-3)\right) = \frac{1}{2}\cos(2X-3)\cdot 2$$
$$= \cos(2X-3)$$

6. Let $u = \sqrt{\theta} = \theta^{\frac{1}{2}}$; $\frac{du}{d\theta} = \frac{1}{2}\theta^{-\frac{1}{2}}$; $du = \frac{1}{2}\theta^{-\frac{1}{2}}d\theta$

$$2\int \frac{\cos\left(\sqrt{\theta}\,(d\theta)\right)\cdot\frac{1}{2}}{\sqrt{\theta}} = 2\int\left(\cos\left(u(du)\right)\right)$$
$$= 2\sin(u) + C$$
$$= 2\sin\left(\sqrt{\theta}\right) + C$$

Check:

$$\frac{d}{d\theta}\left(2\sin\left(\sqrt{\theta}\right)\right) = 2\cos\left(\sqrt{\theta}\right)\cdot\frac{1}{2}\theta^{-\frac{1}{2}}$$
$$= \frac{\cos\left(\sqrt{\theta}\right)}{\sqrt{\theta}}$$

7. Let $u = \tan(\theta)$; $\frac{du}{dX} = \sec^2(\theta)$;

$du = \sec^2(\theta(d\theta))$

$$\int \sqrt{\tan(\theta)}\ \sec^2(\theta(d\theta)) = \int u^{\frac{1}{2}}\ du$$
$$= \frac{u^{\frac{3}{2}}}{\frac{3}{2}} + C$$
$$= \frac{2}{3}u^{\frac{3}{2}} + C$$
$$= \frac{2}{3}(\tan\theta)^{\frac{3}{2}} + C$$

Check:

$$\frac{d}{d\theta}\left(\frac{2}{3}(\tan(\theta))^{\frac{3}{2}}\right) = \frac{2}{3}\cdot\frac{3}{2}(\tan(\theta))^{\frac{1}{2}}\sec^2(\theta)$$
$$= \sqrt{\tan(\theta)}\sec^2(\theta)$$

8. Let $u = 2 - e^{2X}$; $\frac{du}{dX} = -e^{2X}\cdot 2$;

$du = -2e^{2X}dX$

$$-\frac{1}{2}\int e^{2X}(2 - e^{2X})dX(-2) = -\frac{1}{2}\int u(du)$$
$$= -\frac{1}{2}\frac{u^2}{2} + C$$
$$= -\frac{1}{4}u^2 + C$$
$$= -\frac{1}{4}(2 - e^{2X})^2 + C$$

Check:

$$\frac{d}{du}\left(-\frac{1}{4}\left(2 - e^{2X}\right)^2\right) = -\frac{1}{4}\cdot 2\left(2 - e^{2X}\right)\left(-e^{2X}\cdot 2\right)$$
$$= e^{2X}\cdot\left(2 - e^{2X}\right)$$

You could also multiply through which yields $2e^{2X} - e^{4X}$ and integrate each term.

9. Let $u = 1 - X$; $\frac{du}{dX} = -1$; $du = -dX$

$$-\int\frac{dX}{1 - X}(-1) = -\int\frac{du}{u}$$
$$= -\ln(u) + C$$
$$= -\ln(1 - X) + C$$

Check:

$$\frac{d}{dX}\left(-\ln(1 - X)\right) = -\frac{1}{1 - X}(-1)$$
$$= \frac{1}{1 - X}$$

10. Let $u = X^2 + 2X - 1$; $\frac{du}{dX} = 2X + 2$;

$du = (2X + 2)dX$

$$\frac{1}{2}\int\frac{(X+1)dX}{\sqrt[3]{X^2 + 2X - 1}}\cdot 2 = \frac{1}{2}\int\frac{du}{u^{\frac{1}{3}}}$$
$$= \frac{1}{2}\int u^{-\frac{1}{3}}du$$
$$= \frac{1}{2}\frac{u^{\frac{2}{3}}}{\frac{2}{3}} + C$$
$$= \frac{3}{4}u^{\frac{2}{3}} + C$$
$$= \frac{3}{4}(X^2 + 2X - 1)^{\frac{2}{3}} + C$$

Check:

$$\frac{d}{dX}\left(\frac{3}{4}\left(X^2 + 2X - 1\right)^{\frac{2}{3}}\right) =$$
$$= \frac{3}{4}\cdot\frac{2}{3}\left(X^2 + 2X - 1\right)^{-\frac{1}{3}}(2X + 2)$$
$$= \frac{X + 1}{\sqrt[3]{X^2 + 2 - 1}}$$

## Lesson Practice 23C

1. Let $u = t + 4$; $\frac{du}{dt} = 1$; $du = dt$

$$\int \frac{dt}{\sqrt{t+4}} = \int \frac{du}{\sqrt{u}}$$
$$= \int u^{-\frac{1}{2}} du$$
$$= \frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= 2\sqrt{u} + C$$
$$= 2\sqrt{t+4} + C$$

Check:

$$\frac{d}{dt}(2\sqrt{t+4}) = 2 \cdot \frac{1}{2}(t+4)^{-\frac{1}{2}}$$
$$= \frac{1}{\sqrt{t+4}}$$

2. Let $u = 2 - 3Y$; $\frac{du}{dY} = -3$; $du = -3dY$

$$-\frac{1}{3}\int (2-3Y)^5 dY(-3) = -\frac{1}{3}\int u^5(du)$$
$$= -\frac{1}{3}\frac{u^6}{6} + C$$
$$= -\frac{1}{18}u^6 + C$$
$$= -\frac{1}{18}(2-3Y)^6 + C$$

Check:

$$\frac{d}{dY}(-\frac{1}{18}(2-3Y)^6) = -\frac{1}{18} \cdot 6(2-3Y)^5(-3)$$
$$= (2-3Y)^5$$

3. If you let $u = X^2+1$, then $du = 2XdX$ which is not present. You must multiply the numerator and divide by the denominator before integrating.

$$\int \frac{(X^2+1)^2}{X^2} dX = \int \frac{X^4 + 2X^2 + 1}{X^2} dX$$
$$= \int X^2 dX + \int 2dX + \int X^{-2} dX$$
$$= \frac{X^3}{3} + 2X + \frac{X^{-1}}{-1} + C$$
$$= \frac{1}{3}X^3 + 2X - \frac{1}{X} + C$$

Check:

$$\frac{d}{dX}(\frac{1}{3}X^3 + 2X - \frac{1}{X}) = \frac{1}{3}(3X^2) + 2 - (-X^{-2})$$
$$= X^2 + 2 + X^{-2}$$
$$= \frac{X^4 + 2X^2 + 1}{X^2}$$
$$= \frac{(X^2+1)^2}{X^2}$$

4. Let $u = 1 + \tan(\theta)$; $\frac{du}{d\theta} = \sec^2(\theta)$;

$du = \sec^2(\theta(d\theta))$

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

Check :

$$\frac{d}{d\theta}(-\frac{1}{3}(1+\tan(\theta))^{-3} \;)$$
$$= -\frac{1}{3}(-3(1+\tan(\theta))^{-4})\sec^2(\theta)$$
$$= \frac{\sec^2(\theta)}{(1+\tan(\theta))^4}$$

5. Let $u = 1 + \tan(\theta)$; $\frac{du}{d\theta} = \sec^2(\theta)$;

$du = \sec^2(\theta(d\theta))$

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

Check :

$$\frac{d}{d\theta}(-\frac{1}{3}(1+\tan(\theta))^{-3} \;)$$
$$= -\frac{1}{3}(-3(1+\tan(\theta))^{-4})\sec^2(\theta)$$
$$= \frac{\sec^2(\theta)}{(1+\tan(\theta))^4}$$

## Lesson Practice 23D

1. Let $u = \cot(3\theta)$; $\frac{du}{d\theta} = -\csc^2(3\theta)\cdot 3$;

$du = -3\csc^2((3\theta(d\theta)$

$$-\frac{1}{3}\int \cot(3\theta)\;\; \csc^2(3\theta)\;\; d\theta(-3)$$
$$= -\frac{1}{3}\int u\ du$$
$$= -\frac{1}{3}\frac{u^2}{2} + C$$
$$= -\frac{1}{6}u^2 + C$$
$$= -\frac{1}{6}(\cot(3\theta))^2 + C$$

Check :

$$\frac{d}{d\theta}(-\frac{1}{6}(\cot(3\theta))^2 + C)$$
$$= -\frac{1}{6}\cdot 2(\cot(3\theta))\cdot 3(-\csc^2(3\theta))$$
$$= \cot(3\theta)\;\; \csc^2(3\theta)$$

2. There is no substitution that works. Multiply through and integrate.

$$\int (X^2+1)(X^2-2)dX = \int (X^4 - 2X^2 + X^2 - 2)dX$$
$$= \int (X^4 - X^2 - 2)dX$$
$$= \frac{X^5}{5} - \frac{X^3}{3} - 2X + C$$
$$= \frac{1}{5}X^5 - \frac{1}{3}X^3 - 2X + C$$

Check :

$$\frac{d}{dX}(\frac{1}{5}X^5 - \frac{1}{3}X^3 - 2X)$$
$$= \frac{1}{5}\cdot 5X^4 - \frac{1}{3}\cdot 3X^2 - 2$$
$$= X^4 - X^2 - 2$$
$$= (X^2+1)(X^2-2)$$

3. Let $u = 2Y + 1$; $\frac{du}{dY} = 2$; $du = 2dY$

$$\int \frac{4dY}{(2Y+1)^3} = 2\int \frac{4dY \cdot \frac{1}{2}}{(2Y+1)^3}$$
$$= 2\int u^{-3}du$$
$$= \frac{2u^{-2}}{-2} + C$$
$$= -u^{-2} + C$$
$$= -(2Y+1)^{-2} + C$$

Check :

$$\frac{d}{dY}\left(-(2Y+1)^{-2}\right) = -\left(-2(2Y+1)^{-3}(2)\right)$$
$$= 4(2Y+1)^{-3}$$

4. Let $u = \tan(\theta) - 2$; $\frac{du}{d\theta} = \sec^2(\theta)$;
$du = \sec^2(\theta(d\theta))$

$$\int \frac{\sec^2(\theta(d\theta))}{\sqrt{\tan(\theta) - 2}} = \int u^{-\frac{1}{2}}du$$
$$= \frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= 2\sqrt{u} + C$$
$$= 2\sqrt{\tan(\theta) - 2} + C$$

Check :

$$\frac{d}{d\theta}\left(2\sqrt{\tan(\theta) - 2}\right)$$
$$= 2 \cdot \frac{1}{2}(\tan(\theta) - 2)^{-\frac{1}{2}}\sec^2(\theta)$$
$$= \sec^2(\theta)(\tan(\theta) - 2)^{-\frac{1}{2}}$$

5. Let $u = -2X^2$; $\frac{du}{dX} = -4X$; $du = -4XdX$

$$-\frac{1}{4}\int Xe^{-2X^2}dX(-4) = -\frac{1}{4}\int e^u du$$
$$= -\frac{1}{4}e^u + C$$
$$= -\frac{1}{4}e^{-2X^2} + C$$

Check :

$$\frac{d}{dY}\left(-\frac{1}{4}e^{-2X^2} + C\right) = -\frac{1}{4}e^{-2X^2}(-4X)$$
$$= Xe^{-2X^2}$$

# Test 23

1. A $\sec X + C$

2. C $-\frac{1}{2}\int e^{-2X}(-2) = -\frac{1}{2}e^{-2X} + C$

3. D $3\int(X^2 - 2X)dX = \int X^2\,dX - 2\int XdX$
$$= \frac{X^3}{3} - 2\frac{X^2}{2} + C$$
$$= \frac{1}{3}X^3 - X^2 + C$$

4. C Let $u = 3 - Y$; $\frac{du}{dY} = -1$; $du = -dY$
$$\int \frac{dY}{(3-Y)^3} = -\int \frac{dY(-1)}{(3-Y)^3}$$
$$= -\int u^{-3}du$$
$$= -\frac{u^{-2}}{-2} + C$$
$$= \frac{1}{2}(3-Y)^{-2} + C$$

5. A Let $u = 5 - 3X^2$; $\frac{du}{dX} = -6X$; $du = -6XdX$
$$\int X(5-3X^2)^5\,dX = -\frac{1}{6}\int -6X(5-3X^2)^5\,dX$$
$$= -\frac{1}{6}\int u^5du$$
$$= -\frac{1}{6}\frac{u^6}{6} + C$$
$$= -\frac{1}{36}u^6 + C$$
$$= -\frac{1}{36}(5-3X^2)^6 + C$$

6. B Let $u = 2 - \ln X$; $\frac{du}{dX} = -\frac{1}{X}$; $du = -\frac{1}{X}dX$
$$-\int \frac{(2-\ln X)^3}{X}dX(-1) = -\int u^3du$$
$$= -\frac{u^4}{4} + C$$
$$= -\frac{1}{4}(2-\ln X)^4 + C$$

7. D $\int(1+e^X)^2\,dX = \int(1+2e^X+e^{2X})dX$
$$= \int dX + 2\int e^XdX + \frac{1}{2}\int e^{2X}dX(2)$$
$$= X + 2e^X + \frac{1}{2}e^{2X} + C$$

8. D Let $u = 1 + \cot 2\theta$; $\frac{du}{d\theta} = -\csc^2 2\theta\cdot 2$;
$du = -2\csc^2 2\theta d\theta$
$$-\frac{1}{2}\int \frac{\csc^2 2\theta d\theta}{\sqrt{1+\cot 2\theta}}(-2) = -\frac{1}{2}\int \frac{du}{\sqrt{u}}$$
$$= -\frac{1}{2}\int u^{-\frac{1}{2}}du$$
$$= -\frac{1}{2}\frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C$$
$$= -\sqrt{u} + C$$
$$= -\sqrt{1+\cot 2\theta} + C$$

9. A Let $u = X^3 - 15X + 3$; $\frac{du}{dX} = 3X^2 - 15$;
$du = (3X^2 - 15)dX$
$$\frac{1}{3}\int \frac{(X^2-5)dX}{X^3-15X+3}(3) = \frac{1}{3}\int u^{-1}\,du$$
$$= \frac{1}{3}\ln(X^3 - 15X + 3) + C$$

10. B Let $u = 1 - 2\cos 2\theta$; $\frac{du}{dX} = -2(-\sin 2\theta)2$;
$du = 4\sin 2\theta\, d\theta$
$$\frac{1}{4}\int \frac{\sin 2\theta d\theta\cdot 4}{(1-2\cos 2\theta)^3} = \frac{1}{4}\int u^{-3}du$$
$$= \frac{1}{4}\frac{u^{-2}}{-2} + C$$
$$= -\frac{1}{8}(1-2\cos 2\theta)^{-2} + C$$