## 25.1 A List of Basic Antiderivatives

2. $A\frac{1}{n+1}t^{n+1}+C$

4. $\frac{1}{2}\ln|x|+C$

6. $\frac{5}{7}\ln|x|+C$

8. $\arctan x+C$

10. $\frac{1}{5}\tan t+C$

16.(a) $y'=-\frac{\pi}{3}(-\sin(3x)(3))=\pi\sin(3x)$ (b) $-\frac{A}{B}\cos(Bx)+C$

18.(a) $\int\frac{2+x}{x}\,dx=\int(\frac{2}{x}+1)dx=2\ln|x|+x+C$

(b) $\int\frac{3}{x^2}\,dx=\int 3x^{-2}\,dx=3(-1)x^{-1}+C=-\frac{3}{x}+C$

(c) $3\arctan x+C$

(d) $\int\left(\frac{t^3}{4}+\frac{4}{\sqrt{t}}\right)dt=\int\left(\frac{1}{4}t^3+4t^{-\frac{1}{2}}\right)dt=\frac{1}{4}\frac{1}{4}t^4+4(2)t^{\frac{1}{2}}+C=\frac{1}{16}t^4+8\sqrt{t}+C$

## 25.2 Substitution: The Chain Rule in Reverse

. (a) Use $u=2x^2+1,\ du=4x\,dx$: $\int\sqrt{u}\,\frac{1}{4}\,du=\frac{1}{4}\cdot\frac{2}{3}u^{\frac{3}{2}}+C=\frac{1}{6}\left(2x^2+1\right)^{\frac{3}{2}}+C$

(b) Use $u=2x^2+1,\ du=4x\,dx$: $\int u^{-\frac{1}{2}}\cdot\frac{1}{4}\,du=\frac{1}{4}\cdot 2u^{\frac{1}{2}}+C=\frac{1}{2}\sqrt{2x^2+1}+C$

(c) Use $u=\sqrt{x},\ 2du=\frac{1}{\sqrt{x}}dx$: $\int\cos(u)\cdot 2du=2\sin(u)+C=2\sin\left(\sqrt{x}\right)+C$

(d) Use $u=\cos x,\ -du=\sin x\,dx$: $\int-\sqrt{u}\,du=-\frac{2}{3}u^{\frac{3}{2}}+C=-\frac{2}{3}(\cos x)^{\frac{3}{2}}+C$

5. (a) $\frac{5}{3}\arctan(3x)+C$

(b) Use $u=\ln x,\ du=\frac{1}{x}dx$: $\int u\,du=\frac{1}{2}u^2+C=\frac{1}{2}(\ln x)^2+C$

(c) $\int e^{2x}dx=\frac{1}{2}e^{2x}+C$

(d) Use $u=\ln w, du=\frac{1}{w}dw$: $\int u^2du=\frac{1}{3}u^3+C=\frac{1}{3}(\ln w)^3+C$

6. (a) Use $u=t^3, du=3t^2dt$: $\int\sin u\cdot\frac{1}{3}du=-\frac{1}{3}\cos u+C=-\frac{1}{3}\cos(t^3)+C$

(b) Use $u=-x^2,\ du=-2x\,dx$: $\int e^u\cdot\frac{-1}{2}du=-\frac{1}{2}e^u+C=-\frac{1}{2}e^{-x^2}+C$

(c) $\ln|x+5|+C$

(d) Use $u=2t^2+7,\ du=4t\,dt$: $\int\frac{1}{u}\cdot\frac{1}{4}du=\frac{1}{4}\ln|u|+C=\frac{1}{4}\ln|2t^2+7|+C$

9. (a) $3\int_0^1\frac{1}{1+(2w)^2}dw=\frac{3}{2}\arctan(2w)\Big|_0^1=\frac{3}{2}\arctan(2)-\frac{3}{2}\arctan(0)=\frac{3}{2}\arctan(2)$

(b) $\int_0^1\frac{1}{3}+\frac{4}{3}w^2\,dw=\left(\frac{1}{3}w+\frac{4}{9}w^3\right)\Big|_0^1=\frac{1}{3}+\frac{4}{9}=\frac{7}{9}$

(c) $\int_{\pi/2}^{3\pi}\cos\left(\frac{t}{2}\right)dt=2\sin\left(\frac{t}{2}\right)\Big|_{\frac{\pi}{2}}^{3\pi}=2\sin\left(\frac{3\pi}{2}\right)-2\sin\left(\frac{\pi}{4}\right)=2\cdot(-1)-2\cdot\frac{\sqrt{2}}{2}=-2-\sqrt{2}$

(d) $\frac{4}{3}\ln|3x+2|\Big|_1^3=\frac{4}{3}(\ln 11-\ln 5)=\frac{4}{3}\ln\left(\frac{11}{5}\right)$

(e) Use $u=2x+1,\ du=2dx$: $\int_3^9 u^{-2}\cdot\frac{1}{2}du=-\frac{1}{2}u^{-1}\Big|_3^9=-\frac{1}{2}\left(\frac{1}{9}-\frac{1}{3}\right)=-\frac{1}{2}\cdot\frac{-2}{9}=\frac{1}{9}$