~~2~~, ~~14~~, ~~18~~, ~~26~~, ~~29~~, ~~31~~, ~~38~~, 39, ~~45~~, ~~59~~,
~~64~~, 65, 66, 67, 68, 72, 78

2] $\int xe^{-x^2}\,dx$, $u = -x^2$

$du = -2x\,dx$

$-\frac{1}{2}du = x\,dx$

$= -\frac{1}{2}\int e^u\,du$

$= -\frac{1}{2}e^u = \underline{-\frac{1}{2}e^{-x^2} + C}$

14] $\int y^2(4-y^3)^{2/3}\,dy$, $u = 4-y^3$

$du = -3y^2\,dy$

$-\frac{1}{3}du = y^2\,dy$

$= -\frac{1}{3}\int u^{2/3}\,dy$

$= -\frac{1}{\cancel{3}}\frac{\cancel{3}}{5}u^{5/3} + C$

$= \underline{-\frac{1}{5}(4-y^3)^{5/3} + C}$

18] $\int \frac{\sin\sqrt{x}}{\sqrt{x}}\,dx$

$u = \sqrt{x}$

$du = \frac{1}{2\sqrt{x}}\,dx$

$2du = \frac{1}{\sqrt{x}}\,dx$

$= 2\int \sin u\,du$

$= \underline{2(-\cos\sqrt{x}) + C}$

26] $\int \frac{1}{ax+b}\,dx$, $(a \neq 0)$, $u = ax+b$

$du = a\,dx$

$$= \frac{1}{a}\int \frac{1}{u}\,du \qquad \frac{1}{a}du = dx$$

$$= \frac{1}{a}\ln|ax+b| + C$$

29] $\int 5^t \sin(5^t)\,dt$, $u = 5^t$

$$\frac{1}{\ln 5}du = 5^t dt$$

$$= \frac{1}{\ln 5}\int \sin u\,du$$

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

31] $\int \frac{(\tan^{-1}x)^2}{1+x^2}dx$, $u = \tan^{-1}x$

$$du = \frac{dx}{1+x^2}$$

$$= \int u^2\,du \qquad (1+x^2)\,du = dx$$

$$= \frac{1}{3}u^3 + C = \frac{1}{3}(\tan^{-1}x)^3 + C$$

38] $\int \frac{1}{\cos^2 t\sqrt{1+\tan t}}dt$, $u = 1+\tan t$

$$du = \sec^2 t\,dt$$

$$= \int u^{-1/2}\,du$$

$$= 2(1+\tan t)^{1/2} + C$$

39] $\int \frac{\sin 2x}{1+\cos^2 x}dx = \int \frac{2\sin x\cos x}{1+\cos^2 x}dx$, $u = \cos x$

$$-du = \sin x\,dx$$

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

$$= -2$$

45]

$$\int \frac{1+x}{1+x^2}\,dx \quad , \; u = 1+x^2$$

$$du = 2x\,dx$$

$$\frac{1}{2}du = x\,dx$$

$$= \int \frac{1}{1+x^2} + \frac{1}{2}\int \frac{1}{u} = \tan^{-1}x + \frac{1}{2}\ln|1+x^2| + C$$

59]

$$\int_1^2 \frac{e^{1/x}}{x^2}\,dx \; , \quad u = 1/x$$

$$du = -1/x^2\,dx$$

$$-du = \frac{1}{x^2}dx$$

$$= \int_{1/2}^{1} e^u\,du$$

$$= e^u \Big|_{1/2}^{1} = e - \sqrt{e}$$

64]

$$\int_0^a x\sqrt{a^2-x^2}\,dx \quad , \; u = a^2 - x^2$$

$$du = -2x\,dx$$

$$-\frac{1}{2}du = x\,dx$$

$$= \frac{1}{2}\int_0^{a^2} u^{1/2}\,du$$

$$= \frac{1}{2}\cdot\frac{2}{3}u^{3/2}\Big|_0^{a^2} = \frac{1}{3}u^{3/2}\Big|_0^{a^2} = \frac{1}{3}a^3$$

78]

$$\int_0^1 \boxed{x}\sqrt{1-x^4}\;dx$$

$$u = x^2 \qquad du = 2x\,dx$$

$$\frac{du}{2} = x\,dx$$

$x = 0 \quad u = 0$

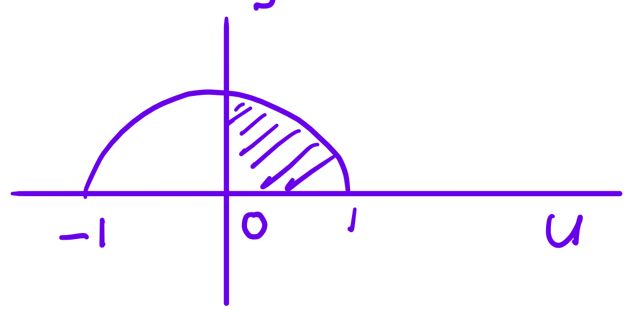
$x=1 \quad u=1$

$$\int_0^1 \sqrt{1-u^2}\,\frac{du}{2}$$

$$\frac{1}{2}\int_0^1 \sqrt{1-u^2}\,du$$

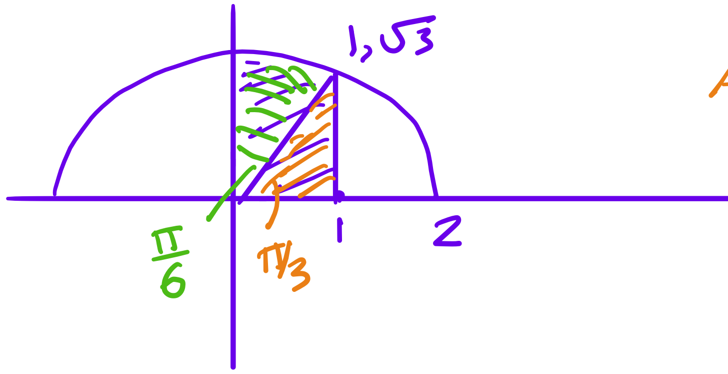
$$y=\sqrt{1-u^2}$$
$$y^2=1-u^2$$
$$y^2+u^2=1$$

$$\frac{1}{2}\cdot\frac{1}{4}\pi(1)^2=\boxed{\frac{\pi}{8}}$$



$$\int_0^1 \sqrt{4-x^2}\,dx$$

Hard Question



$$A_\Delta=\frac{1}{2}(1)(\sqrt{3})=\frac{\sqrt{3}}{2}$$

$$A_{sector}=\frac{\theta}{2\pi}\,\pi(2)^2$$

$$A_{sector}=\frac{\cancel{\pi}/6}{2\cancel{\pi}}\cdot\pi(2)^2$$

$$=\frac{1}{12}\cdot 4\pi=\frac{\pi}{3}$$

$$\frac{1}{\cancel{4}}\cdot\cancel{4}\pi=\pi$$

$$A=\frac{\pi}{3}+\frac{\sqrt{3}}{2}=\frac{2\pi+3\sqrt{3}}{6}$$

$$A_{sector} = \frac{\theta}{2\pi} \pi r^2$$

83) $$f(t) = \frac{1}{2} \sin\left(\frac{2\pi t}{5}\right)$$

$$v(t) = \int_0^t \frac{1}{2} \sin\left(\frac{2\pi \tau}{5}\right) dt$$

$$-\frac{1}{2} \cos\left(\frac{2\pi \tau}{5}\right) \Big|_0^t$$

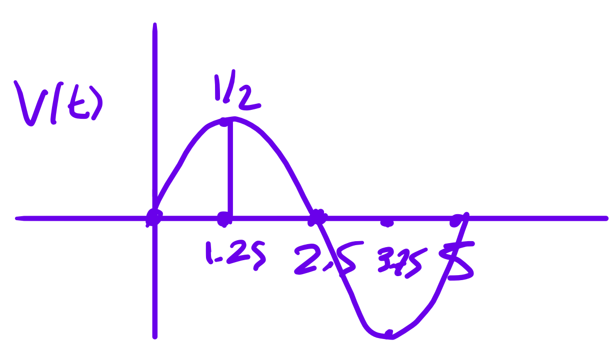
$$-\frac{1}{2} \left[\cos\left(\frac{2\pi t}{5}\right) - 1 \right]$$

$$\frac{1}{2} \left[1 - \cos\left(\frac{2\pi t}{5}\right) \right]$$

$$v(t) = \int_0^t \frac{1}{2} \sin\left(\frac{2\pi \tau}{5}\right) dt$$

b) Find $\frac{dv}{dt} =$

$$\frac{dv}{dt} = \frac{1}{2} \sin\left(\frac{2\pi \tau}{5}\right)$$

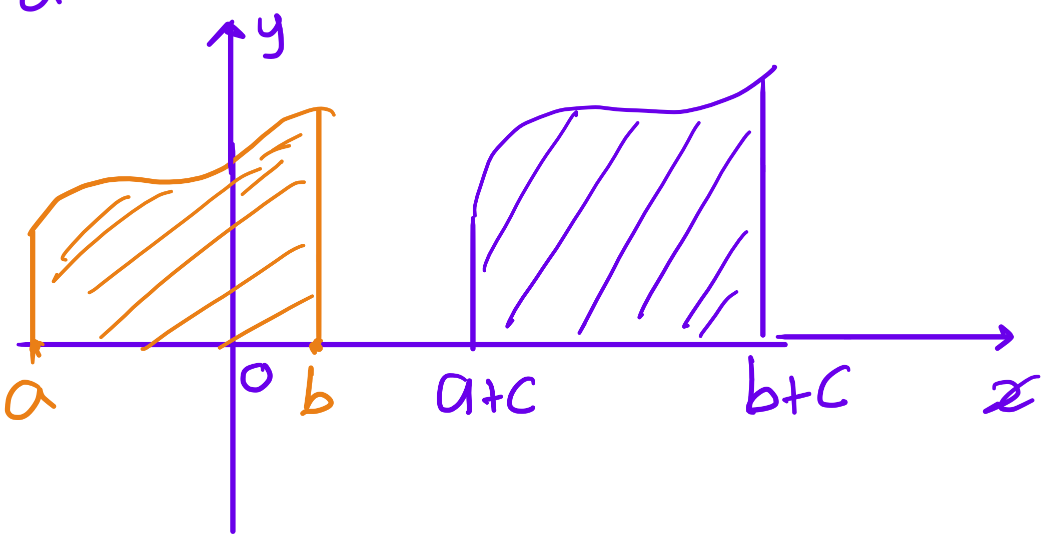


$\frac{5}{4} = 1.25$

---

90)

$$\int_a^b f(x+c)\,dx = \int_{a+c}^{b+c} f(x)\,dx$$



$$\int_{x=a}^{x=b} f(x+c)\,dx$$

$u = x+c \qquad du = dx$

$x = a \qquad u = a+c$

$x = b \qquad u = b+c$

$$\int_{a+c}^{b+c} f(u)\,du$$

$b+c$

$$\int_{a+c} f(x)\,dx$$

91] a & b positive numbers

$$\int_0^1 x^a (1-x)^b\,dx = \int_0^1 x^b (1-x)^a\,dx$$

$u = 1 - x \qquad du = -dx$

$x = 1 - u$

$x = 0 \qquad u = 1$

$x = 1 \qquad u = 0$

$$-\int_1^0 (1-u)^a \cdot u^b\,du$$

$$\int_0^1 u^b (1-u)^a\,du$$

$u \longleftrightarrow x$

$$\int_0^1 x^b (1-x)^a\,dx$$

Ex.3]

dv

$$\int \underbrace{\overset{u}{t^2}}_{\text{algebraic}} \underbrace{e^t}_{\text{exponential}} \, dt$$

$u = t^2 \quad du = 2t\,dt \quad \int dv = \int e^t \, dt \quad v = e^t$

$$t^2 e^t - \int e^t \cdot 2t \, dt$$

$$t^2 e^t - 2\boxed{\int t e^t \, dt} \; **$$

$u = t \quad du = dt \quad \int dv = \int e^t \, dt \quad v = e^t$

$$t e^t - \int e^t \, dt$$

$$\boxed{t e^t - e^t} \; **$$

$$t^2 e^t - 2(t e^t - e^t) + C$$

$$t^2 e^t - 2t e^t + 2e^t + C$$

Ex 4)

$$I = \int e^x \sin x \, dx$$

$u = e^x \quad du = e^x\,dx \quad dv = \sin x\,dx \quad v = -\cos x$

$$I = -e^x \cos x - \int -\cos x \cdot e^x \, dx$$

$$I = -e^x \cos x + \boxed{\int e^x \cos x \, dx} \; ***$$

apply IBP again

$u = e^x \quad du = e^x\,dx$

$dv = \cos x\,dx \quad v = \sin x$

$$\boxed{e^x \sin x - \int \sin x \cdot e^x \, dx} \; ***$$

$$I = -e^x \cos x + e^x \sin x - \boxed{\underbrace{\int e^x \sin x \, dx}_{= I}}$$

$$\frac{\cancel{2} I}{\cancel{2}} = \frac{-e^x \cos x + e^x \sin x}{2} + C$$

$$I = \frac{-e^x \cos x + e^x \sin x}{2} + C$$

---

5)

$$\int_0^1 \tan^{-1} x \, dx$$

LIATE

$\tan^{-1} x \qquad 1$

$u = \tan^{-1} x \qquad dv = 1\,dx$

$du = \frac{1}{1+x^2}\,dx \qquad v = x$

$$\int_0^1 \tan^{-1} x \, dx = x\tan^{-1} x - \int_0^1 \frac{x}{1+x^2}\,dx$$

$$\int_0^1 \tan^{-1} x \, dx = x\tan^{-1} x \Big]_0^1 - 2\int_0^1 \frac{1}{u}\,du$$

$u = 1 + x^2$

$du = 2x\,dx$

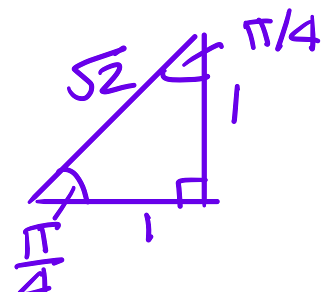
$$\int_0^1 \tan^{-1} x \, dx = x\tan^{-1} x \Big]_0^1 - 2\Big[\ln|u|\Big]_0^1$$

$$= x\tan^{-1} x - 2\ln(1+x^2)\Big]_0^1$$

$$= \left[\tan^{-1}(1) - 2\ln(2)\right] - \left[0 - 0\right]$$

$$= \tan^{-1}(1) - \ln 4 = 1$$

$$= \frac{\pi}{4} - \ln 4$$



$$= x\tan^{-1} x - 2\ln(1+x^2)\Big|_0^1$$

AP TEST Q... P. 19 AP Calculus Book

AP Test Q

$$\int x^2 e^{8x}\,dx \qquad u = x^2 \quad dv = e^{8x}\,dx \qquad du = 2x\,dx \quad v = \frac{1}{8}e^{8x}$$

$$= \frac{1}{8}x^2e^{8x} - \boxed{\frac{1}{4}\int xe^{8x}} \longrightarrow u = x \quad dv = e^{8x}\,dx \qquad du = dx \quad v = \frac{1}{8}e^{8x}$$

$$= \frac{1}{8}xe^{8x} - \frac{1}{8}\int e^{8x}\,dx$$

$$= \frac{1}{8}xe^{8x} - \frac{1}{8}\left(\frac{1}{8}e^{8x}\right)$$

$$= \frac{1}{8}x^2e^{8x} - \frac{1}{4}\left(\frac{1}{8}xe^{8x} - \frac{1}{64}e^{8x}\right) + C$$

$$= \frac{1}{8}x^2e^{8x} - \frac{1}{32}xe^{8x} + \frac{1}{256}e^{8x} + C$$

B ✓

Ex. 6

$$I = \int \sin^n x\,dx$$

STEP 1

$$\int \sin^{n-1} x \, \sin x \, dx$$

$$u = \sin^{n-1} x \qquad du = (n-1)[\sin x]^{n-2} \cdot \cos x \, dx$$

$$u = (\sin x)^{n-1}$$

$$dv = \sin x \, dx \qquad v = -\cos x$$

$$I = -\cos x \cdot \sin^{n-1} x - \int -\cos x \cdot (n-1)[\sin x]^{n-2} \cos x \, dx$$

$$I = -\cos x \cdot \sin^{n-1} x + (n-1) \int \boxed{\sin^{n-2} x} \cos^2 x \, dx$$

$$\cos^2 x \Rightarrow \boxed{1 - \sin^2 x}$$

$$I = -\cos x \cdot \sin^{n-1} x + (n-1) \int \sin^{n-2} x \, (1 - \sin^2 x) \, dx$$

$$I = -\cos x \cdot \sin^{n-1} x + (n-1) \int \sin^{n-2} x \, dx - \underbrace{\boxed{\int \sin^n x \, dx}}_{(n-1)} = I$$

$$I = -\cos x \sin^{n-1} x + (n-1) \int \sin^{n-2} x \, dx - (n-1) I$$

$$I + (n-1) I = -\cos x \sin^{n-1} x + (n-1) \int \sin^{n-2} x \, dx$$

$$\frac{\cancel{n} I}{\cancel{n}} = \frac{-\cos x \sin^{n-1} x}{n} + \frac{(n-1)}{n} \int \sin^{n-2} x \, dx$$

$$I = -\frac{\cos x \sin^{n-1} x}{n} + \frac{n-1}{n}\int \sin^{n-2} x\, dx$$

$n=5$ $\quad$ $n=3$

$$\int \sin^5 x\, dx = \frac{-\cos x \sin^4 x}{n} + \frac{4}{5}\boxed{\int \sin^3 x\, dx}$$

$n=3$

$$I_1 = -\frac{\cos x \sin^2 x}{3} + \frac{2}{3}\int \sin x\, dx$$

$$I_1 = \boxed{-\frac{\cos x \sin^2 x}{3} - \frac{2}{3}\cos x}$$

$$\int \sin^5 x\, dx = \frac{-\cos x \sin^4 x}{5} + \frac{4}{5}\left(-\frac{\cos x \sin^2 x}{3} - \frac{2}{3}\cos x\right)$$

$$= -\frac{\cos x \sin^4 x}{5} - \frac{4}{15}\cos x \sin^2 x - \frac{8}{15}\cos x + C$$

9) Stewart 7.1 P 476

$$\int \cos^{-1} x\, dx$$

$$\frac{d}{dx}\cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$$

$u = \cos^{-1} x \qquad dv = 1\,dx$

$du = \frac{-1}{\quad}\,dx \qquad v = x$

$\sqrt{1-x^2}$

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

$u = 1-x^2$
$du = -2x\,dx$

$\frac{du}{-2} = x\,dx$

$= x\cos^{-1}x + \frac{1}{2}\int \frac{1}{\sqrt{u}}\,du$

$= x\cos^{-1}x + \frac{1}{2}\int u^{-1/2}\,du$

$= x\cos^{-1}x + \frac{1}{2}\cdot\frac{2}{1}u^{1/2} + C$

$= x\cos^{-1}x + \sqrt{u} + C$

$= x\cos^{-1}x + \sqrt{1-x^2} + C$

---

10)

$\int \ln(\sqrt{x})\,dx$

1) u-SUB
2) By Parts Integration

$\int_a^b u\,dv = uv\Big|_a^b - \int_a^b v\,du$

$\int \ln(\sqrt{x})\,dx$

$u = \ln\sqrt{x}$ $\quad dv = 1\,dx$

$du = \frac{1}{\sqrt{x}}\cdot\frac{1}{2\sqrt{x}}\,dx$ $\quad v = x$

$$du = \frac{1}{2x}\,dx$$

$$\int \ln(\sqrt{x})\,dx = x\ln(\sqrt{x}) - \int \frac{\cancel{x}}{2\cancel{x}}\,dx$$

$$= x\ln(\sqrt{x}) - \frac{1}{2}\int dx$$

$$= x\ln(\sqrt{x}) - \frac{1}{2}x + C$$

$$= \frac{1}{2}x\ln x - \frac{1}{2}x + C$$

$$\int \ln x^{1/2}\,dx$$

$$\frac{1}{2}\boxed{\int \ln x\,dx}$$

$$\frac{1}{2}[x\ln x - x]$$

17]

$$I = \int e^{2\theta}\sin 3\theta\,d\theta$$

$$\boxed{u = e^{2\theta}} \quad du = 2e^{2\theta}\,d\theta$$

$$I =$$

$$dv = \sin 3\theta\,d\theta$$

$$v = -\frac{\cos(3\theta)}{3}$$

$$I = -\frac{1}{3}e^{2\theta}\cos(3\theta) - \int -\frac{\cos(3\theta)}{3} \cdot 2e^{2\theta}\,d\theta$$

$$I = -\frac{1}{3}e^{2\theta}\cos(3\theta) + \frac{2}{3}\boxed{\int e^{2\theta}\cos(3\theta)\,d\theta}$$

$$u = e^{2\theta} \quad du = 2e^{2\theta}\,d\theta \quad dv = \cos(3\theta)\,d\theta$$

$$v = \frac{\sin(3\theta)}{3}$$

$$\boxed{\frac{e^{2\theta}\sin(3\theta)}{3} - \int \frac{\sin(3\theta)}{3} \cdot 2e^{2\theta}\,d\theta}$$

$$I = -\frac{1}{3}e^{2\theta}\cos(3\theta) + \frac{2}{3}\left[\frac{e^{2\theta}\sin(3\theta)}{3} - \frac{2}{3}\underbrace{\boxed{\int e^{2\theta}\sin(3\theta)\,d\theta}}_{\text{"} I}\right]$$

$$I = -\frac{1}{3}e^{2\theta}\cos(3\theta) + \frac{2}{9}e^{2\theta}\sin(3\theta) - \frac{4}{9}I$$

$$\frac{9}{13} \cdot \frac{\cancel{13}}{\cancel{9}} I = \left(-\frac{1}{3}e^{2\theta}\cos(3\theta) + \frac{2}{9}e^{2\theta}\sin(3\theta)\right)\frac{9}{13}$$

$$I = \frac{9}{13}\left(-\frac{1}{3}e^{2\theta}\cos(3\theta) + \frac{2}{9}e^{2\theta}\sin(3\theta)\right) + C$$

72/a)

$$\int f(x)\,dx = x f(x) - \int x f'(x)\,dx$$

$\qquad\qquad\quad \downarrow u \quad \downarrow dv$

$u = f(x) \quad du = f'(x)\,dx \qquad dv = dx \qquad v = x$

$x f(x) - \int x \cdot f'(x)\,dx$

AP Style

7] $\quad f(1) = 2 \qquad f(4) = 7 \qquad f'(1) = 5 \qquad f'(4) = 3$

f'' continuous

$$\int_1^4 \underset{u}{x}\, \overbrace{f''(x)\,dx}^{dv}$$

$u = x \qquad dv = f''(x)\,dx$

$du = dx \qquad v = f'(x)$

$$= x f'(x)\Big]_1^4 - \underbrace{\int_1^4 f'(x)\,dx}$$

$f(x)\Big|_1^4$

$$= x f'(x)\Big]_1^4 - \big(f(4) - f(1)\big)$$

$$= \Big[\big[4 \cdot f'(4)\big] - f'(1)\Big] - \big(f(4) - f(1)\big)$$

$$= (12 - 5) - (7 - 2)$$

$$= 7 - 5 = 2 \ \checkmark$$

---

37 – 42   p 477   Stewart   AP Calc. Sty6

Strategy

$t = \sqrt{x}$ "u-sub"

by Parts

$dx = 2\sqrt{x}\, dt$

37) $\int e^{\sqrt{x}}\, dx$

$t = \sqrt{x}$ $dt = \frac{1}{2\sqrt{x}}\, dx$

$\int e^{t} \cdot 2\sqrt{x}\, dt$ t

$2\int t e^{t}\, dt$

$u = t$ $du = dt$ $dv = e^{t}\, dt$ $v = e^{t}$

$2\left(t e^{t} - \int e^{t}\, dt\right)$

$2\left(\sqrt{x}\, e^{\sqrt{x}} - e^{\sqrt{x}}\right) + C$

***

38) $\int \cos(\ln x)\, dx$ $\boxed{t = \ln x}$ $dt = \frac{1}{x}\, dx$

$dx = x\, dt$

$= \int \cos(t)\, x\, dt$

$t = \ln x$

$e^{t} = e^{\ln x} = x$

$$I = \int e^t \cos t \, dt \qquad t = \ln x$$

$u = e^t \qquad dv = \cos t \, dt$

$du = e^t dt \qquad v = \sin t$

$$= e^t \sin t - \int e^t \sin t \, dt$$

$u = e^t \qquad dv = \sin t \, dt$

$du = e^t dt \qquad v = -\cos t$

$= I$

$$= -e^t \cos t + \boxed{\int e^t \cos t \, dt}$$

$$I = e^t \sin t - \left(-e^t \cos t + I\right)$$

$$I = e^t \sin t + e^t \cos t - I$$

$$\frac{\cancel{2}I}{\cancel{2}} = \frac{e^t \sin t + e^t \cos t}{2} + C$$

$$I = \frac{e^t(\sin t + \cos t)}{2} + C$$

30) $\displaystyle\int_1^{\sqrt{3}} \tan^{-1}\left(\frac{1}{x}\right) dx$ AP Style

$u = \tan^{-1}\left(\frac{1}{x}\right) \qquad du = \dfrac{1}{1 + \frac{1}{x^2}} \cdot \dfrac{-1}{x^2} \, dx$

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

$$dv = dx \qquad v = x$$

$$x\tan^{-1}(1/x) - \int x \cdot \left(\frac{-1}{x^2+1}\right) dx$$

$$x\tan^{-1}\left(\frac{1}{x}\right) + \int \frac{x}{x^2+1}\,dx$$

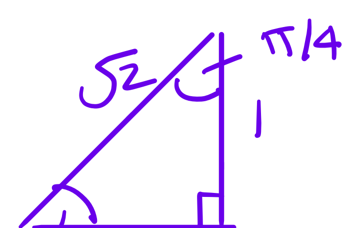
$$\omega = x^2+1 \qquad d\omega = 2x\,dx$$

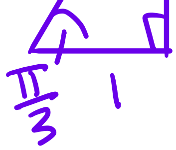
$$\frac{d\omega}{2} = x\,dx$$

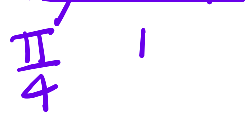
$$\int \frac{1}{\omega}\,\frac{d\omega}{2}$$

$$x\tan^{-1}\left(\frac{1}{x}\right) + \frac{1}{2}\ln(x^2+1)\Big|_{1}^{\sqrt{3}}$$

$$\sqrt{3}\,\overset{\pi/6}{\boxed{\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)}} + \frac{1}{2}\ln(4) - \left[\,1\,\overset{\pi/4}{\boxed{\tan^{-1} 1}} + \frac{1}{2}\ln 2\,\right]$$







$$\sqrt{3}\,\frac{\pi}{6} + \frac{1}{2}\ln 4 - \frac{\pi}{4} - \frac{1}{2}\ln 2$$

Trig Integrals

$$\cos^2 x + \sin^2 x = 1$$

$$\sin^2 x = \frac{1}{2}\left(1 - \cos(2x)\right)$$

$$\cos^2 x = \frac{1}{2}\left(1 + \cos(2x)\right)$$

$$= \sec^2 x$$

$1 + \tan^2 x = \sec^2 x$

$\frac{d}{dx} \tan x = \sec^2 x$

$\frac{d}{dx} \sec x = \sec x \tan x$

$1 + \tan^2 x = \sec^2 x$

$1 + \cot^2 x = \csc^2 x$

---

odd

Ex. 1) $\int \cos^3 x \, dx$

odd power

reduce odd power by 1

$$\int \overset{(1-\sin^2 x)}{\boxed{\cos^2 x}} \cos x \, dx$$

$$\int (1-\sin^2 x) \cos x \, dx$$

$u = \sin x \qquad du = \cos x \, dx$

$$\int (1-u^2)\,du$$

$$u - \frac{u^3}{3} + C$$

$$\boxed{\sin x - \frac{\sin^3 x}{3} + C}$$

Ex. 2)

$$\int \sin^5 x \cos^2 x \, dx$$

odd

$$\int \boxed{\sin^4 x} \cos^2 x \sin x \, dx$$

$$\int (1-\cos^2 x)^2 \cos^2 x \sin x \, dx$$

$u = \cos x \quad du = -\sin x \, dx$

$$-\int (1-u^2)^2 u^2 \, du$$

$$-\int (1-2u^2+u^4) u^2 \, du$$

$$-\int (u^2 - 2u^4 + u^6)\, du$$

$$-\left[\frac{u^3}{3} - \frac{2u^5}{5} + \frac{u^7}{7} \right] + C$$

$$-\frac{u^3}{3} + \frac{2}{5}u^5 - \frac{u^7}{7} + C$$

$$-\frac{\cos^3 x}{3} + \frac{2}{5}\cos^5 x - \frac{1}{7}\cos^7 x + C$$

$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$ $\cos^2 x = \frac{1}{2}(1 + \cos 2x)$

$$\int_0^{\pi} \sin^2 x \, dx$$

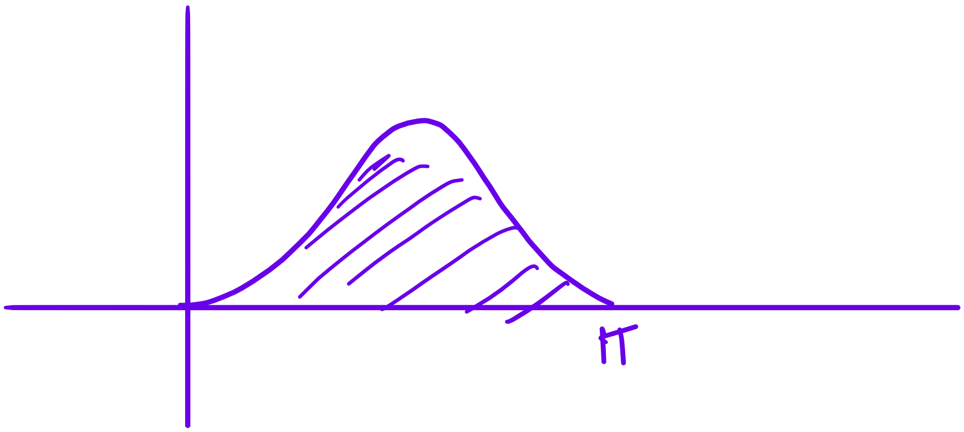
$$\int_0^{\pi} \frac{1}{2}(1 - \cos 2x)\, dx$$

$$\frac{1}{2}\left[\int_0^{\pi} (1 - \cos 2x)\, dx \right]$$

$$\frac{1}{2}\left[x - \frac{\sin(2x)}{2} \right]_0^{\pi}$$

$$\frac{1}{2}\left[\, x - \frac{\quad}{2} \,\right]_0$$

$$\frac{1}{2}\left[\, \pi - 0 - (0-0) \,\right] = \frac{\pi}{2}$$



Ex. 4] <u>AP Style Exam Q</u>

$$\int \sin^4 x \, dx$$

$$\int (\sin^2 x)^2 \, dx$$

$$\int \left[\frac{1}{2}(1-\cos 2x)\right]^2 dx$$

$$\frac{1}{4}\int (1-\cos 2x)^2\,dx$$

$$\frac{1}{4}\int \left[1 - 2\cos 2x + \cos^2(2x)\right] dx$$

***

$$\frac{1}{4}\left[x - \frac{\cancel{2}\sin(2x)}{\cancel{2}} + \boxed{\int \cos^2(2x)\,dx} \right]$$

$$\int \cos^2(2x)\,dx = \frac{1}{2}\int (1+\cos 4x)\,dx$$

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

$$\frac{1}{4}\left[x - \sin(2x) + \frac{x}{2} + \frac{\sin(4x)}{8} \right] + C$$

$$\frac{1}{4}x - \frac{1}{4}\sin(2x) + \frac{1}{8}x + \frac{1}{32}\sin(4x) + C$$

HW 7.1 6, 12, 18, 21 hard, 20

22, 29

hint $\sin 2x = 2\sin x \cos x$

hint $\sin 2x = 2\sin$

32, 36, 39, 40, 69,

a few videos

Hw 7.2 1, 3, 7