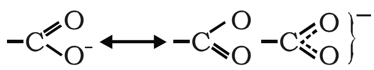
PART B - CHEMISTRY

31. **c) A soap**

An alkali salt of palmitic acid is known as soap. The general formula of palmitic acid $C_{15}H_{31}COOH$. Which on hydrolysis in presence of alkali give soap ($C_{15}H_{31}COONa$) and glycerol as by product.

32. **b) Resonance**

Acids do not reacts with $NaHSO_3$ though they have >C = O group because of resonance stabilization. The resonance take place as follows.



33. **d) $CH_3COCOOH$**

$$\underset{\text{Propionic acid}}{CH_3CH_2COOH} \xrightarrow[SeO_2]{[O]} \underset{\text{Pyruvic acid}}{CH_3COCOOH} + H_2O$$

34. **b) $LiAlH_4$**

Acid are directly reduced to the corresponding primary alcohol with powerful reductant like $LiAlH_4$. It attack only on the carbonyl group of a fatty acid.

$$R-\overset{\overset{O}{\|}}{C}-OH + 4H \xrightarrow{LiAlH_4} \underset{\text{Alkanol}}{RCH_2OH} + H_2O$$

35. **a) $Hg^{2+} + H_2SO_4$; $H^+ + Cr_2O_7^{2-}$; NaOH + CaO**

$$\underset{\text{Acetylene}}{CH\equiv CH} \xrightarrow[(x)]{Hg^{2+}/H_2SO_4} CH_3-CHO \xrightarrow[(y)]{H^+/Cr_2O_7^{2-}}$$

$$\underset{\text{Ethanoic acid}}{CH_3-COOH} \xrightarrow[CaO]{NaOH} \underset{\text{Methane}}{CH_4}$$

36. **c) CH_3CN ; CH_3COOH ; CH_3CONH_2**

$$\underset{\substack{\text{Ethane nitrile}\\(X)}}{CH_3CN} \xrightarrow{H_3O^+} \underset{\substack{\text{Ethanoic acid}\\(Y)}}{CH_3COOH} \xrightarrow{NH_3}$$

$$\underset{\text{Ammonium ethanoate}}{CH_3COONH_4} \xrightarrow{\Delta} \underset{\text{Ethanamide}}{CH_3CONH_2}$$

$$\xrightarrow{Br_2/KOH} \underset{\text{Amino methane}}{CH_3NH_2}$$

37. **c) Methyl cyanide**

Methyl Cyanide on reacting with a Grignard's reagent produces a ketone

$$\underset{\text{methyl cyanide}}{CH_3-C\equiv N} \xrightarrow{+CH_3MgI} CH_3-\underset{\underset{CH_3}{|}}{C}=NMgI$$

$$\xrightarrow[-MgINH_2]{+CH_3MgI} \underset{\text{acetone}}{CH_3-\underset{\underset{CH_3}{|}}{C}=O}$$

38. **a) Clemensen's reduction**

Alkanes are prepared by Clemensen's reduction. The ketones are reduced to alkanes in the presence of Zn/Hg and HCl.

$$\underset{\text{propanone}}{CH_3-CO-CH_3} \xrightarrow[HCl]{Zn/Hg} \underset{\text{propane}}{CH_3CH_2CH_3}$$

39. **a) Acetone**

On strongly heating (dry distillation) of anhydrous calcium acetate, acetone is formed.

$$\underset{\text{calcium Acetate}}{\begin{matrix}CH_3CO.O\\CH_3CO.O\end{matrix}\!>Ca} \xrightarrow{\Delta} \underset{\text{acetone}}{\begin{matrix}CH_3\\CH_3\end{matrix}\!>CO} + CaCO_3$$

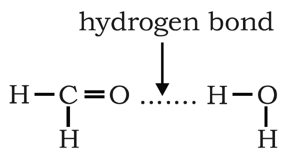
40. **b) An alkyl Cyanide is reduced with $SnCl_2$ and HCl**

Alkyl Cyanides on reduction with $SnCl_2$ and HCl give aldimines which on hydrolysis yield aldehydes. This reaction is known as Stephen's reaction.

$CH_3-C\equiv N \xrightarrow{+2H} CH_3-CH=NH$
ethane nitrile **acetaldimine**

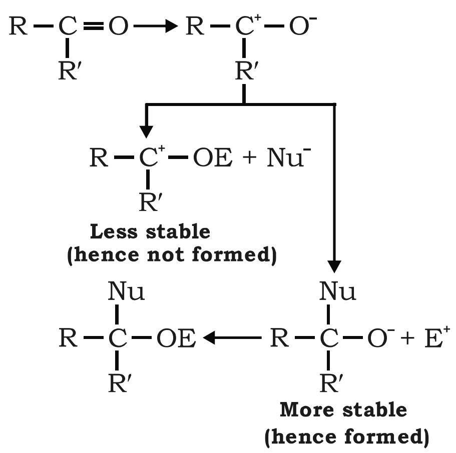
$\xrightarrow[-NH_3]{+H_2O} CH_3CHO$
acetaldehyde

41. **a) Methanal**
Methanal is highly soluble in water due to its ability to form H–bond with water. It's 40% solution in water is known as formalin and is used as a preservative for biological specimens.



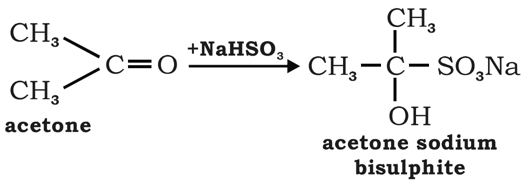
42. **a) HCHO**
The more reactive substance towards nucleophillic reagents is HCHO because in this case the carbon atom of carbonyl < C^+-O^- group has greatest + charge, so it is more suspectible to attack of nucleophillic reagents. In CH_3CHO and CH_3COCH_3, the positive charge on the carbon atom of > C = O group is decreased due to + I effect of CH_3 groups attached to it.

43. **a) Carbonyl compounds undergo nucleophillic addition reaction**
The true statement is that carbonyl compounds undergo nucleophillic addition reactions



44. **d) $NaHSO_3$**
Carbonyl compounds reacts with $NaHSO_3$ to form a colorless crystalline product.

$CH_3CHO \xrightarrow{+NaHSO_3} CH_3CH(OH)-SO_3Na$
acetaldehyde **acetaldehyde sodium bisulphite**



45. **d) 2.4–dinitrofluoro benzene**
Substituted ammonia derivatives react with carbonyl comounds (aldehydes and ketones) to give stable crystalline products, which are used for the identification of aldehydes and ketones. Since 2,4-dinitrofluoro benzene is not a substituted ammonia derivative, hence it is not used in making derivatives of aldehydes and ketones.

46. **d) All of these**
All aldehydes, not containing a-Hydrogen atoms, react with cold concen, alkali to form a corresponding alcohol and a salt of the corresponding acid. The aldehyde gets oxidised as well as reduced, hence all the statements given above are true.

$HCHO + HCHO + NaOH \longrightarrow$
methanal

$HCOO^-Na^+$ **(sodium methanoate)** $+CH_3OH$ **(methanol)**

47. **b) Benzaldehyde**
Aldehydes, not containing α-Hydrogen atoms under go cannizzaro's reaction hence benzaldehyde will undergo this reaction in the presence of cold concentrated alkali.

$$\begin{matrix} C_6H_5CHO \\ C_6H_5CHO \end{matrix} + NaOH \longrightarrow \begin{matrix} C_6H_5CHOO^-Na^+ \\ + \\ C_6H_5CH_2OH \end{matrix}$$

benzaldehyde — **benzylalcohol**

48. **d) Ammonical $AgNO_3$**

C

49. **b) Ethanol**

The catalytic reduction of acetaldehyde by Hydrogen yields ethanol.

$$R-CHO + 2H \xrightarrow{Na/C_2H_5OH} R-CH_2OH$$

(a primary alcohol)

$$\underset{\textbf{acetaldehyde}}{CH_3-CHO} + 2H \xrightarrow{Na/C_2H_5OH} \underset{\textbf{ethanol}}{CH_3-CH_2OH}$$

50. **b) Ethyl acetate**

When acetaldehyde is treated with Aluminium ethoxide in the presence of a little anhydrous Aluminium chloride, it undergoes esterification and forms an ester ethyl acetate. This reaction is known as Tischenko reaction

$$\underset{\textbf{acetaldehyde}}{CH_3-\underset{OH}{\overset{H}{C}}-CH_2-\overset{H}{C}=O} \xrightarrow[AlCl_3]{Al(OC_2H_5)_3} \underset{\textbf{ethyl acetate}}{CH_3-\underset{O}{\underset{||}{C}}-O-CH_2-CH_3}$$

bakelite

51. **c) Fehling solution**

Fehling solution is a mixture of two solutions–

a) Fehling solutin A : It is a CuSO4 solution (blue colour)

b) Fehling solution B : It is a colorless solution of Rochelle salt (Sodium Potassium tartarate) and NaOH

$$CuSO_4 + 2NaOH \longrightarrow Cu(OH)_2 + Na_2SO_4$$

$$Cu(OH)_2 \longrightarrow CuO + H_2O$$

$$HCHO + 2CuO \longrightarrow HCOOH + Cu_2O(\downarrow)$$

Red ppt.

$$R-CHO + 2CuO \longrightarrow RCOOH + Cu_2O(\downarrow)$$

Red ppt.

52. **a) Iodine + alkali**

Acetaldehye and acetone can be distinguished by Tollen's reagent Fehling solution and Schiff's reagent. However they can not be distinguished by I2 & alkali, because both contain CH3CHO-group, form iodoform (yellow precipitate) on treatement with I2 & NaOH.

$$\underset{\textbf{acetaldehyde}}{CH_3-CHO} \xrightarrow[-3HI]{+3I_2/NaOH} \underset{\textbf{iodal}}{Cl_3CHO} \xrightarrow{+NaOH}$$

$$\underset{\textbf{iodoform}}{CHI_3} + \underset{\textbf{sodium formate}}{HCOONa}$$

$$\underset{\textbf{iodal}}{CH_3COCH_3} \xrightarrow[-HI]{+I_2/NaOH} CHI_3 + CH_3COONa$$

53. **d) $C_6H_5COCH_2COCH_3$**

Keto – enol tautomerism is shown by $C_6H_5COCH_2COCH_3$ as follows :

$$C_6H_5-\overset{O}{\overset{||}{C}}-CH_2-\overset{O}{\overset{||}{C}}-CH_3 \Leftrightarrow$$

keto

$$C_6H_5-\overset{OH}{\overset{||}{C}}=CH-\overset{O}{\overset{||}{C}}-CH_3$$

enol

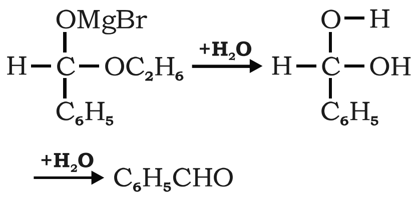
54. **b) Benzaldehyde**

$$C_6H_5-\underset{O}{\underset{||}{C}}-Cl + H_2 \xrightarrow{Pd/BaSO_4} C_6H_5CHO + HCl$$

55. **c) Ethyl orthoformate**

Benzaldehyde may be prepared from phenyl magnesium bromide by it's reaction with ethyl orthoformate

$$H-\overset{O}{\overset{||}{C}}-OC_2H_2 + C_6H_5MgBr \longrightarrow$$



56. **d)** **Benzoyl chloride**

57. **b)** **C_6H_5 CHO**

$C_6H_5\ COH \xrightarrow{Cl_2} C_6H_5\ COCl + HCl$

58. **c)** **CH_3.CO.R**

Aromatic aldehydes as well as a-hydroxy ketones are oxidisable by Tollen's reagent

59. **a)** **NaOH**

Benzaldehyde (C_6H_5 – CHO) and formaldehyde do not have α-hydrogen atoms so they give disproportionation reaction with NaOH but CH_3CHO does not give it.

60. **d)** **An aromatic aldehyde or formaldehyde**

The aldehydes which do not have α-hydrogen atoms show disproportionation reaction. These aldehyde may be aliphatic aldehyde (formaldehyde) or aromatic aldehyde.

PART C - MATHS

61. **c)** $-\cot(xe^x)$

$$\int \frac{e^x(x+1)}{\sin^2(xe^x)}dx$$

$xe^x = t$, $e^x(x+1)\ dx = dt$

$$\Rightarrow \int \frac{dt}{\sin^2 t} \Rightarrow -\cot t + c$$

$$\Rightarrow -\cot(xe^x) + c$$

62. **b)** $\log\left(\frac{e^x}{1+e^x}\right) + C$

$$\Rightarrow \int \frac{e^x}{e^x(e^x+1)}$$

$e^x = t$
$e^x dx = dt$

$$\Rightarrow \int \frac{dt}{t(t+1)} = \ln\left|\frac{t}{1+t}\right| + c$$

$$\Rightarrow \ln\left|\frac{e^x}{1+e^x}\right| + c$$

63. **b)** $\frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{x^2-4}{2\sqrt{2}x}\right) + C$

$$\int \frac{1+\frac{4}{x^2}}{x^2+\frac{16}{x^2}}dx$$

$$x - \frac{4}{x} = t \Rightarrow \left(1+\frac{4}{x^2}\right)dx = dt$$

$$= \int \frac{dt}{t^2+8}$$

$$\Rightarrow \frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{t}{2\sqrt{2}}\right) + c$$

$$\Rightarrow \frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{x^2-4}{2\sqrt{2}x}\right) + c$$

64. **b)** $\frac{-\cos x}{2+5\sin x}$

$$\int \frac{(2\tan x + 5\sec x)\sec x}{(2\sec x + 5\tan x)^2}dx$$

$2\sec x + 5\tan x = t$

$(2\sec\tan x + 5\sec^2 x)\ dx = dt$

$$\Rightarrow \int \frac{dt}{t^2} = \frac{-1}{t} + c$$

$$= \frac{-1}{2\sec x + 5\tan x} + c$$

$$= \frac{-\cos x}{2+5\sin x}$$

65. **d)** $\frac{-\cot x}{(\cos x)^{2005}} + C$

$$I = \int \frac{\operatorname{cosec}^2 x - 2005}{\cos^{2005} x}dx$$

$$= \int \frac{\operatorname{cosec}^2 x\cos^{2005} x - 2005\cos^{2005} x\,dx}{\cos^{4010} x}$$

$$= \int d\left(\frac{-\cot x}{\cos^{2005} x}\right)$$

$$= \frac{-\cot x}{\cos^{2005} x} + c$$

66. **b)** $\frac{-1}{2}\sin 2x + c$

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

$$\Rightarrow \int -\cos 2x\,dx$$

$$\Rightarrow \frac{-1}{2}\sin 2x + c$$

67. **b)** $-\frac{x^4}{2(1+x^3)^2} + C$

$$= \int \frac{x^6 - 2x^3}{x^6\left(x+\frac{1}{x^2}\right)^3}dx$$

$x + \frac{1}{x^2} = t$
$\left(1-\frac{2}{x^3}\right)dx = dt$

$$\Rightarrow \int \frac{dt}{t^3} = \frac{-1}{2t^2} + c$$

$$= \frac{-x^4}{2(1+x^3)} + c$$

68. **a)** $\frac{1}{n}\log\left(\frac{x^n}{x^n+1}\right)+c$

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

$x^n = t \Rightarrow n(x^{n-1})\, dx = dt$

$\Rightarrow \frac{1}{n}\int \frac{dt}{t(t+1)}$

$\Rightarrow \frac{1}{n}\log\left(\frac{x^n}{x^n+1}\right)+c$

69. **c)** $2\sin^{-1}\left(\sin\frac{x}{2}-\cos\frac{x}{2}\right)+C$

$\int \frac{\sqrt{1+\sin x}}{\sqrt{\sin x}}$

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

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

70. **c)** $-\frac{1}{3x^3}+\frac{1}{x}+\tan^{-1}x+C$

$\frac{dx}{x^4\left(x^2+1\right)}$

$\frac{1}{x^4\left(x^2+1\right)} = \frac{A}{x^2}+\frac{B}{x^4}+\frac{C}{x^2+1}$

C = 1, A = –1, B = 1

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

$\Rightarrow \frac{1}{x}-\frac{1}{3x^2} + \tan^{-1}(x) + c$

71. **c)** $2e^{\sqrt{x}}\left(x-\sqrt{x}+1\right)+C$

$\sqrt{x} = t$

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

$= 2\int e^t\left(t^2+t\right)dt$

$\Rightarrow 2(e^t(t^2+t) - e^t(2t+1) + 2e^t) + c$

$\Rightarrow 2e^t(t^2 - t + 1) + c$

$\Rightarrow 2\,e^{\sqrt{x}}(x - \sqrt{x} + 1) + c$

72. **d)** $e^{\tan\theta}\cos\theta + C$

$\tan\theta = t \sec^2\theta\, d\theta = dt$

$d\theta = \frac{dt}{1+t^2}$

$\int e^t\left(\frac{1}{\sqrt{1+t^2}}-\frac{1}{\left(\sqrt{1+t^2}\right)^3}\right)dt$

$\Rightarrow \frac{e^t}{\sqrt{1+t^2}} + C = e^{\tan\theta}\cos\theta + c$

73. **b)** $\cos x-\frac{1}{2}\cos 2x-\frac{1}{3}\cos 3x+C$

$= 4\sin x\cos\frac{x}{2}\cos\frac{3x}{2}$

$= \sin 3x - \sin x + \sin 2x$

$I = \cos x - \frac{1}{2}\cos 2x - \frac{-1}{3}\cos 3x + c$

74. **c)** $\tan^{-1}(\tan x - \cot x) + C$

$\int \frac{dx}{\cos^4 x+\sin^4 x-\sin^2 x\cos^2 x}$

$\Rightarrow \int \frac{\sin^4 x\,dx}{1+\tan^4 x-\tan^2 x}$

$\boxed{\tan x = t}$

$\Rightarrow \int \frac{t^2+1dt}{1+t^4-t^2}$

$\Rightarrow \tan^{-1}(\tan x - \cot x) + c$

75. **a)** $\log x - f(x) + C$

$\int \frac{x^5}{x\left(x+x^5\right)}$

$\Rightarrow \int\frac{dx}{x}-\int\frac{dx}{x+x^5}$

$\Rightarrow \log x - f(x) + C$

76. **b)** $2\sqrt{1+\sqrt{1+x^2}}+C$

$1 + x^2 = t$

$2x\,dx = dt$

$\Rightarrow \frac{1}{2}\int \frac{dt}{\sqrt{t}\left(\sqrt{1+\sqrt{t}}\right)}$

$\Rightarrow 2\sqrt{1+\sqrt{t}}+c$

$\Rightarrow 2\sqrt{1+\sqrt{1+x^2}}+c$

77. **a)** $\frac{\sin x}{2+3\cos x}+C$

$\int \frac{\left(3\operatorname{cosec}^2 x + 2\operatorname{cosec} x \cot x\right)}{\left(2\operatorname{cosec} x + 3\cot x\right)^2}dx$

$\Rightarrow \frac{1}{2\operatorname{cosec} x + 3\cot x}+c$

$\Rightarrow \frac{\sin x}{2+3\cos x}+c$

78. **b)** $\frac{x^{10}}{2\left(x^5+x^3+1\right)^2}+C$

$\int \frac{\left(\frac{2}{x^3}+\frac{5}{x^6}\right)dx}{\left(1+\frac{1}{x^2}+\frac{1}{x^5}\right)^3}$

$1+\frac{1}{x^2}+\frac{1}{x^5}=t$

$\left(\frac{-2}{x^3}-\frac{5}{x^6}\right)dx = dt$

$\Rightarrow \int \frac{-dt}{t^3} \Rightarrow \frac{1}{2t^2}+c$

$\Rightarrow \frac{x^{10}}{2\left(x^5+x^3+1\right)^2}+c$

79. **a)** $\frac{4}{15}\left(1-\frac{1}{x^3}\right)^{5/4}+C$

$\int \frac{\left(1-\frac{1}{x^3}\right)^{1/4}}{x^4}dx$

$1-\frac{1}{x^3}=t$

$\frac{3dx}{x^4}=dt$

$= \frac{1}{3}\int t^{1/4}dt$

$= \frac{4}{15}\left(1-\frac{1}{x^3}\right)^{5/4}+C$

80. **a)** $l^{r+1}(x) + C$

$\frac{dx}{xl(x)l^2(n)l^3(n)\dots l^r(n)} = dt$

$\int dt = t + 1$

$= l^{r+1}(x) + 1$

81. **d)** $\frac{1}{2}x^2e^{x^2}e^{x^4}+C$

$\int e^{x^4+x^2}(2x^5 + x^3 + x)\,dx$

$\Rightarrow \frac{1}{2}\int e^{x^4+x^2}(4x^5 + 2x^3 + 2x)\,dx$

$\Rightarrow \frac{1}{2}\int\left[e^{x^4+x^2}(2x) + e^{x^4+x^2}x^2\left(4x^3+2x\right)\right]dx$

$\Rightarrow \frac{1}{2}\left(e^{x^4+x^2}x^2\right)+c$

82. **c)** $\frac{1}{2}\left[\log(\tan x)\right]^2+C$

$\int \frac{\log(\tan x)}{\tan x\cos^2 x}dx$

$\log(\tan x) = a$

$\frac{1}{\tan x}\sec^2 x\,dx = da$

$\Rightarrow \int t\,dt = \frac{t^2}{2}+c$

$= \frac{\left(\log(\tan x)\right)^2}{2}+c$

83. **a)** $\left(\frac{x-1}{x+1}\right)e^x + C$

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

$\Rightarrow e^x\left(\frac{x^2-1}{x+1}\right)+c$

84. **c)** $\frac{1}{2}\left[x\sec^2 x+\tan x\right]+C$

$\int x\tan x\sec^2 x\,dx$

$\Rightarrow \frac{x\tan^2 x}{2}-\int\frac{\tan^2 x}{2}dx$

$\Rightarrow \frac{x\tan^2 x}{2}+\frac{x}{2}-\frac{\tan x}{2}+c$

85. **c)** $x(\log x)^n + C$

In = $\int(\log x)^n\,dx$

= $\int 1(\log x)^n\,dx$

= $x(\log x)^n - \int x\,n(\log x)^n\times\frac{1}{x}dx$

= $x(\log x)^n - n\,I_n - 1$

$I_n + nI_{n-1} = x(\log x)^n$

86. **b)** $A=\frac{1}{8}$, $B=-\frac{1}{5}$

$1 + x^3 = t$

$3x^2dx = dt$

$\frac{1}{3}\int(t-1)\,t^{2/3}\,dt$

$= \frac{1}{3}\int\left(t^{5/3}-t^{2/3}\right)dt$

$\Rightarrow \frac{1}{8}\,t^{8/3}-\frac{1}{5}\,t^{5/3}+c$

$A=\frac{1}{8}$ $B=\frac{-1}{5}$

87. **c)** $\frac{1}{6(m+1)}\left(2x^{3m}+3x^{2m}+6x^m\right)^{\frac{m+1}{m}}$

$I_m = \int\left(x^{3m-1}+x^{2m-1}+x^{m-1}\right).$

$\left(2x^{3m}+3x^{2m}+6x^m\right)^{\frac{1}{n}}dx$

$= \frac{1}{6(m+1)}\left(2x^{3m}+3x^{2m}+6x^m\right)^{\frac{m+1}{m}}+c$

88. **a)** $\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\tan x-\cot x}{\sqrt{2}}\right)+c$

$\int\frac{\sec^4 x\,dx}{\tan^4 x+1}$

$\tan x = t$

$\Rightarrow \int\frac{1+t^2}{1+t^4}dt$

$\Rightarrow \int\frac{\frac{1}{t^2}+1}{t^2+\frac{1}{t^2}}dt$

$t-\frac{1}{t}=k$

$\Rightarrow \int\frac{dk}{k^2+2}$

$= \frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{k}{\sqrt{2}}\right)$

$= \frac{1}{\sqrt{2}}\left(\tan^{-1}\left(\frac{\tan x-\cot x}{\sqrt{2}}\right)\right)+c$

89. **a)** $\cos x$

Differentiating on both sides

$\sqrt{1+\sin x}\,f(x)$

$= \frac{2}{3}\times\frac{3}{2}\sqrt{1+\sin x}\cos x$

$f(x) = \cos x$

90. **b)** $e^x\tan\left(x-\frac{\pi}{4}\right)+C$

$\int e^x\left(\frac{2\sin x}{\sin x+\cos x}+\cot^2\left(x+\frac{\pi}{4}\right)\right]$

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

$$\Rightarrow \int e^x \left[\frac{\sin x - \cos x}{\sin x + \cos x} + \cos ec^2\left(x + \frac{\pi}{4}\right)\right] dx$$

$$\Rightarrow \int e^x \left[-\cot\left(\frac{\pi}{4} + x\right) + \cos ec^2\left(\frac{x+\pi}{4}\right)\right] dx$$

$$\Rightarrow \int e^x \left(-\cot\left(\frac{\pi}{4} + x\right)\right] + c$$

$$\Rightarrow e^x \left(\tan\left(x - \frac{\pi}{4}\right)\right] + c$$