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EE206 Assignment 1

1.(a)

$\frac{d}{dx}\ln(5x\cdot\sqrt{x+8})$

sol. $= \frac{1}{2}\cdot\frac{(5x\sqrt{x+8})'}{5x\sqrt{x+8}}$

$= \frac{1}{2}\cdot\frac{15x^2+200x}{25x^3+200x^2}$

$= \frac{3x+16}{2x^2+16x}$,

1.(b)

$\frac{d}{dx}\frac{\sqrt{1+2x}}{e^{3x}}$

$= \frac{\frac{1}{2}(1+2x)^{-1}\cdot 2\cdot e^{3x} - 3\sqrt{1+2x}\,e^{3x}}{e^{6x}}$

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

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

1.(c)

$\frac{d}{dx}\ln(\sin x)$

$= \frac{\cos x}{\sin x}$

$= \cot x$

2.(a) $\int x\cot(x^2+1)\,dx$

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

Let $x^2+1 = t$

$I = \int \frac{1}{2}\frac{\cos t}{\sin t}\,dt$

$= \frac{1}{2}\ln|\sin t| + C$

$= \frac{1}{2}\ln|\sin(x^2+1)| + C$

2.(b) $\int \frac{\sin 3\sqrt{x}}{\sqrt{x}}\,dx$

$= 2\int \sin 3\sqrt{x}\,d\sqrt{x}$

Let $\sqrt{x} = a$

$= 2\int \sin 3a\cdot da$

$= -\frac{2}{3}\cos 3a + C$

$= -\frac{2}{3}\cos 3\sqrt{x} + C$

2.(c) $\int \frac{dt}{t\ln t}$

Let $u = \ln t$

$\frac{du}{dt} = \frac{1}{t}$

$\int \frac{dt}{t\ln t} = \ln|\ln|t||$

2.(d) $\int t\cos t\cdot dt$

Let $u=t$ $v=\sin t$

$du = dt$ $dv = \cos t\cdot dt$

so $\int t\cos t\,dt$

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

$= t\sin t - \cos t + C$