

8/200211

EE206 Assignment 1

1.(a)

$$\begin{aligned}
 \frac{d}{dx} \ln(5x \cdot \sqrt{x+8})^{-1} \\
 \text{sol.} &= \frac{1}{2} \cdot \frac{(5x \cdot \sqrt{x+8})^{-1}}{\sqrt{25x^3 + 200x^2}} \times (75x^2 + 200x) \\
 &= \frac{1}{2} \cdot \frac{75x^2 + 200x}{25x^3 + 200x^2} \\
 &= \frac{3x + 16}{2x^2 + 16x}
 \end{aligned}$$

$$\begin{aligned}
 2(a) \int x \cot(x^2 + 1) dx \\
 = \int \frac{1}{2} \frac{\cos(x^2 + 1)}{\sin(x^2 + 1)} d(x^2 + 1)
 \end{aligned}$$

$$\begin{aligned}
 \text{Let } x^2 + 1 &= t \\
 I &= \int \frac{1}{2} \frac{\cot t}{\sin t} dt \\
 &= \frac{1}{2} \ln |\sin t| + C \\
 &= \frac{1}{2} \ln |\sin(x^2 + 1)| + C
 \end{aligned}$$

1.(b)

$$\begin{aligned}
 \frac{d}{dx} \frac{\sqrt{1+2x}}{e^{3x}} \\
 = \frac{\frac{1}{2}(1+2x)^{-\frac{1}{2}} \cdot 2 \cdot e^{3x} - \sqrt{1+2x} \cdot e^{3x}}{e^{6x}} \\
 = \frac{(1+2x)^{-\frac{1}{2}} - 3(1+2x)^{\frac{1}{2}}}{e^{3x} (1+2x)^{\frac{1}{2}}} (1+2x)^{\frac{1}{2}} \\
 = \frac{-2(1+3x)}{e^{3x} (1+2x)^{\frac{1}{2}}}
 \end{aligned}$$

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

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

$$\text{Let } \sqrt{x} = a$$

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

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

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

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

$$\text{Let } u = \ln t$$

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

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

1.(c)

$$\begin{aligned}
 \frac{d}{dx} \ln(\sin x) \\
 = \frac{\cos x}{\sin x} \\
 = \cot x
 \end{aligned}$$

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

$$\text{Let } u = t \quad v = \sin t$$

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

$$\text{so } \int t \cot t \cdot dt$$

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

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