

Name: Solutions

Section: 7 8

1. Differentiate the following functions. You do not need to simplify :)

(a)  $f(x) = \cot \ln x + \ln(7x^{5/2} - 3)$ .

$$f'(x) = -\csc^2 \ln x \cdot \frac{1}{x} + \frac{1}{7x^{5/2} - 3} \cdot (7 \cdot 5/2 x^{3/2})$$

(b)  $s(x) = e^{7x+2} + e^{x \ln 10}$ .

$$s'(x) = e^{7x+2} \cdot (7) + e^{x \cdot \ln 10} \cdot (\ln 10)$$

(c)  $g(x) = (\sin x)^{\tan x}$

$$\Rightarrow \ln g(x) = \ln((\sin x)^{\tan x})$$

$$\Rightarrow \ln g(x) = \tan x \cdot \ln \sin x$$

$$\Rightarrow \frac{g'(x)}{g(x)} = \sec^2 x \cdot \ln \sin x + \tan x \cdot \frac{\cos x}{\sin x}$$

$$\begin{aligned} \Rightarrow g'(x) &= (\sin x)^{\tan x} \left[ \sec^2 x \cdot \ln \sin x + \tan x \cdot \cot x \right] \\ &= (\sin x)^{\tan x} \left[ \sec^2 x \cdot \ln \sin x + 1 \right] \end{aligned}$$

2. Evaluate the integrals

$$\begin{aligned} \text{(a) } \int \frac{3x^2}{x^3+2} dx &\quad \rightarrow \quad = \int \frac{du}{u} \\ u = x^3 + 2 & \\ du = 3x^2 dx & \\ &= \ln|u| + C \\ &= \ln|x^3 + 2| + C \end{aligned}$$

$$\begin{aligned} \text{(b) } \int \cos x e^{\sin x} dx &\quad \rightarrow \quad = \int e^u du \\ u = \sin x & \\ du = \cos x dx & \\ &= e^u + C \\ &= e^{\sin x} + C \end{aligned}$$