Section 5.8

Definitions of Hyperbolic Functions

$$\sinh x = \frac{e^x - e^{-x}}{2} \qquad \operatorname{csch} x = \frac{1}{\sinh x}, \quad x \neq 0$$

$$\cosh x = \frac{e^x + e^{-x}}{2} \qquad \operatorname{sech} x = \frac{1}{\cosh x}$$

$$\tanh x = \frac{\sinh x}{\cosh x} \qquad \coth x = \frac{1}{\tanh x}, \quad x \neq 0$$

Hyperbolic Identities

$$\cosh^2 x - \sinh^2 x = 1$$

$$2 \sinh x \cosh x = \sinh 2x$$

$$\cosh^2 x + \sinh^2 x = \cosh 2x$$

$$\tanh^2 x + \operatorname{sech}^2 x = 1$$

$$\coth^2 x - \operatorname{csch}^2 x = 1$$

1) Find the derivatives of the following hyperbolic functions.

a) $y = \cosh(3x^2 - 2x)$

b) $y = \operatorname{csch}^2\left(\sqrt{x}\right)$

2) Find the indefinite integrals.

a) $\int \tanh^2(3x)\,\mathrm{sech}^2(3x)dx$

b) $\int e^x\,\mathrm{csch}^2(e^x)\,dx$

3) Find the following:

a) $\frac{d}{dx}[\cosh^{-1}(x^2)]$

b) $\int \frac{dx}{\sqrt{(x+2)^2-9}}$

Homework for 5.8: #15, 25, 31, 34, 45, 57