

Name KEY Date _____ Period _____

Worksheet 10.6—Hyperbolic Functions

Show all work on a separate sheet of paper. No Calculator

Free Response & Short Answer

1. Find the derivatives with respect to x of each of the following functions

(a) $y = \coth 10x$

$$\frac{d}{dx} : \frac{dy}{dx} = -\operatorname{csch}^2(10x) \cdot 10$$

$$= -10 \operatorname{csch}^2(10x)$$

(b) $f(x) = 10^{\operatorname{sech} 2x}$

$$f'(x) = 10^{\operatorname{sech}(2x)} \cdot \ln 10 \cdot (-\operatorname{sech}(2x) \cdot \tanh(2x)) \cdot 2$$

$$= -2 \ln 10 \cdot \operatorname{sech}(2x) \cdot \tanh(2x) \cdot 10^{\operatorname{sech}(2x)}$$

(c) $y = e^{2x} \tanh 7x$

$$y' = e^{2x} \cdot 2 \cdot \tanh(7x) + e^{2x} \cdot (\operatorname{sech}^2(7x)) \cdot 7$$

$$= e^{2x} (2 \tanh(7x) + 7 \operatorname{sech}^2(7x))$$

(d) $g(x) = \ln(\operatorname{csch}(x^3))$

$$g'(x) = \frac{1}{\operatorname{csch}(x^3)} \cdot (-\operatorname{csch}(x^3) \operatorname{coth}(x^3)) \cdot 3x^2$$

$$g'(x) = \frac{-3x^2 \operatorname{csch}(x^3) \operatorname{coth}(x^3)}{\operatorname{csch}(x^3)}$$

$$g'(x) = -3x^2 \operatorname{coth}(x^3)$$

Multiple Choice

2. Evaluate the following integrals.

C (a) $\int \sinh(3x+4) dx =$

- (A) $3 \cosh(3x+4) + C$
- (B) $-3 \cosh(3x+4) + C$
- (C) $\frac{1}{3} \cosh(3x+4) + C$
- (D) $-\frac{1}{3} \cosh(3x+4) + C$
- (E) $\frac{1}{3} \sinh(3x+4) + C$

$$\int \sinh(3x+4) dx$$

$$\frac{1}{3} \cosh(3x+4) + C$$

A (b) $\int \cosh^5 x \sinh x dx =$

- (A) $\frac{1}{6} \cosh^6 x + C$
- (B) $6 \cosh^6 x + C$
- (C) $5 \cosh^4 x + C$
- (D) $\frac{1}{4} \cosh^4 x + C$
- (E) $\frac{1}{5} \cosh^5 x + C$

$$\int (\cosh x)^5 \cdot \sinh x dx$$

$$\frac{1}{6} (\cosh x)^6 + C$$

$$\frac{1}{6} \cosh^6 x + C$$