SCORE: 3 /30 POINTS

- NO CALCULATORS OR NOTES ALLOWED
- SHOW PROPER CALCULUS-LEVEL WORK
- **SIMPLIFY ALL ANSWERS**

For this question, you may use the formulae for  $\frac{d}{dx} \sinh x$ ,  $\frac{d}{dx} \cosh x$  and/or  $\frac{d}{dx} \tanh x$  without proving them. SCORE:  $\frac{d}{dx} / 8$  PTS

If you need to use the formula for the derivative of any other hyperbolic function, you must prove it.

Without using the exponential formula for sech x, prove the formula for  $\frac{d}{d}$  sech x. [a]

d sech x da cosha

 $= \frac{1}{\cos h^2 x} \cdot \sinh x \cdot (2)$   $= \frac{\sinh hx}{\cosh^2 x}$ 

Without using the logarithmic formula for  $\tanh^{-1} x$ , prove the formula for  $\frac{d}{dx} \tanh^{-1} x$ .

y= tenh x.

x = tanhy (1) dx = dy · cosh'y

dy = coshiy

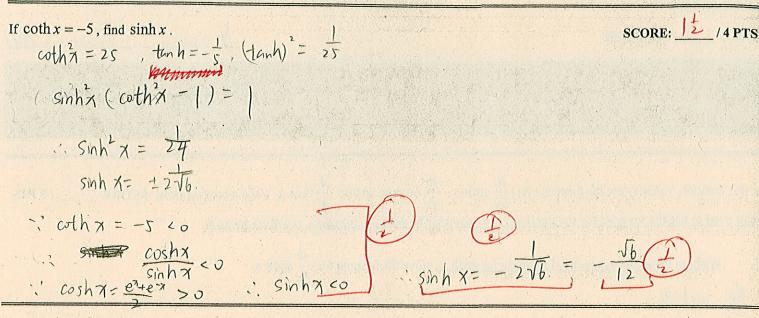
(tanh x/= (sinh x)'= wshx

: dx tanh x = 1-x2

Find lim coth x algebraically.

= lim (1+ e2x-e->x)

:. lim cothx = ±1



Prove the logarithmic formula for  $\sinh^{-1} x$  given in your textbook. NOTE: This is NOT a question about derivatives.

SCORE: 3 /5 PTS

$$y = \sinh^{-1}x \qquad t^{2} - 2tx = 1$$

$$x = \sin h y \qquad (t - x)^{2} = 1 + x^{2}$$

$$x = \frac{e^{y} - e^{-y}}{2} \qquad (t - x)^{2} = 1 + x^{2}$$

$$t - x = \pm \sqrt{1 + x^{2}} \qquad (e^{y} > 0) \qquad t = x + \sqrt{1 + x^{2}} \qquad (e^{y} > 0) \qquad t = x + \sqrt{1 + x^{2}} \qquad (e^{y} = x + \sqrt{1 + x^{2}}) \qquad (e^{y} = x + \sqrt{1 + x^{2}$$

Find  $\frac{d}{dx}x^2 \cosh^{-1}(x^5)$ . Simplify your final answer as a single fraction.

SCORE: 2/4PTS

You may use the derivatives of any hyperbolic or inverse hyperbolic functions from your textbook without proving them.

$$\frac{d}{dx} x^{2} \cosh^{-1}(x^{5})$$

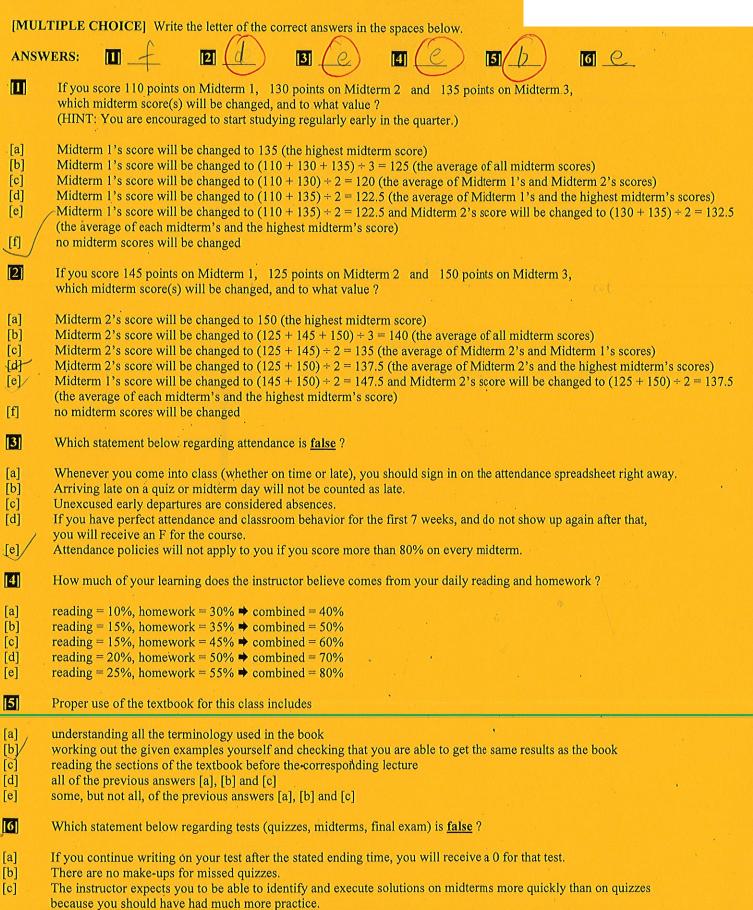
$$= 2x \cosh^{-1}(x^{5}) + x^{2} \cdot 5x^{4} \cdot \sqrt{x^{2}} - 1$$

$$= 2x \cosh^{-1}(x^{5}) + \frac{5x^{6}}{\sqrt{x^{2}} - 1}$$

Tue Jan 12, 2016

[e]

2



If your tablet, phone, computer etc. makes an audible noise during a test, you will lose 10% of all points available on that test.

If you cannot make the scheduled final exam time for any reason, your final exam can be rescheduled.