

### AP<sup>®</sup> Calculus BC 2003 Sample Student Responses Form B

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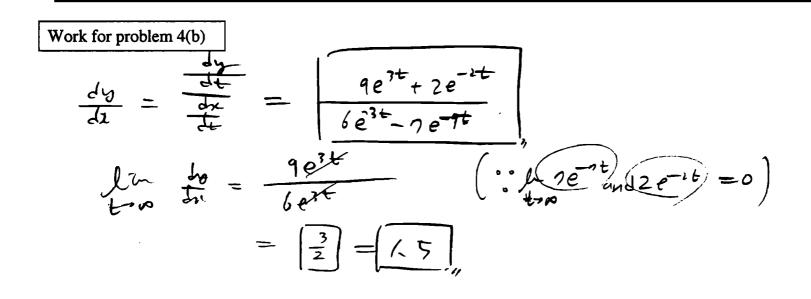
### NO CALCULATOR ALLOWED

## **CALCULUS BC SECTION II, Part B** Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.

Work for problem 4(a)



Continue problem 4 on page 11.



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NO CALCULATOR ALLOWED

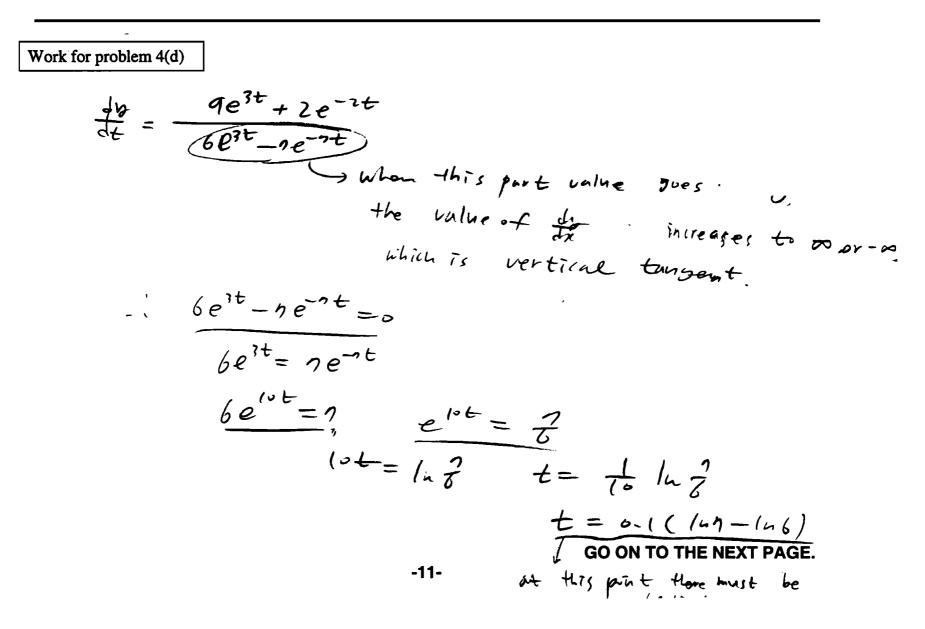
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Work for problem 4(c) thorizon hal trangent is  $\frac{f'(x)=0}{f(x)=0} = \frac{4}{f(x)}$   $\frac{dw}{dx} = \frac{4e^{3t} + 2e^{-2t}}{6e^{3t} - 2e^{-t}} = 0$ but  $4e^{3t} > 0$  ( $t \in IR$ )  $2e^{2t} > 0$  ( $t \in IR$ )  $50 \quad 4e^{3t} + 2e^{-2t} > 0$  ( $t \in IR$ ) Herefore there is no horizontal tangent.



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# NO CALCULATOR ALLOWED

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CALCULUS BC SECTION II, Part B

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.

Work for problem 4(a)  

$$y'(t) = 3 \times e^{3t} \times 3 - e^{-2t} \times (-2) = 9e^{3t} + 2e^{-2t}$$
  
 $\chi'(t) = 6e^{3t} - \eta e^{-nt}$   
velocity vector for the particle  $(6e^{3t} - \eta e^{-nt}, 9e^{3t} + 2e^{-2t})$   
 $speed = |velocity| = \left|\frac{qe^{3t} + 2e^{-2t}}{6e^{3t} - \eta e^{-nt}}\right| = \left|\frac{q+2}{6-\eta}\right| = (1)$ 

Work for problem 4(b)

$$\frac{dy}{dx} = \frac{9e^{3t} + 2e^{-2t}}{6e^{3t} - 7e^{-nt}}$$
  

$$\lim_{t \to \infty} \frac{dy}{dx} = \lim_{t \to \infty} \frac{9e^{3t}}{6e^{3t}} = \lim_{t \to \infty} \frac{3}{2} = \frac{3}{2}$$

Continue problem 4 on page 11.

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Work for problem 4(c)  
The line tangent to the parth of the particle that is horizontal  
must have a slope of 0.  
Find values of t where 
$$\frac{dy}{dx} = 0$$
  
 $9e^{3t} + 2e^{-2t} > 0$ . for all values of t  
because  $e^{3t}$  is always a positive value  
and  $e^{-2t}$  is also always a positive value  
Therefore, none exists.

Work for problem 4(d) For the line tangent to the path of the particle to be vertical,  $\frac{dy}{dx}$  must be inpinite.  $\frac{dy}{dx}$  is infinite when  $6e^{3t} - 7e^{-nt} = 0$  $6e^{3t} = 7e^{-nt}$ 

GO ON TO THE NEXT PAGE.

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