

2008 AP[®] CALCULUS BC FREE-RESPONSE QUESTIONS

5. The derivative of a function f is given by $f'(x) = (x - 3)e^x$ for $x > 0$, and $f(1) = 7$.
- (a) The function f has a critical point at $x = 3$. At this point, does f have a relative minimum, a relative maximum, or neither? Justify your answer.
 - (b) On what intervals, if any, is the graph of f both decreasing and concave up? Explain your reasoning.
 - (c) Find the value of $f(3)$.
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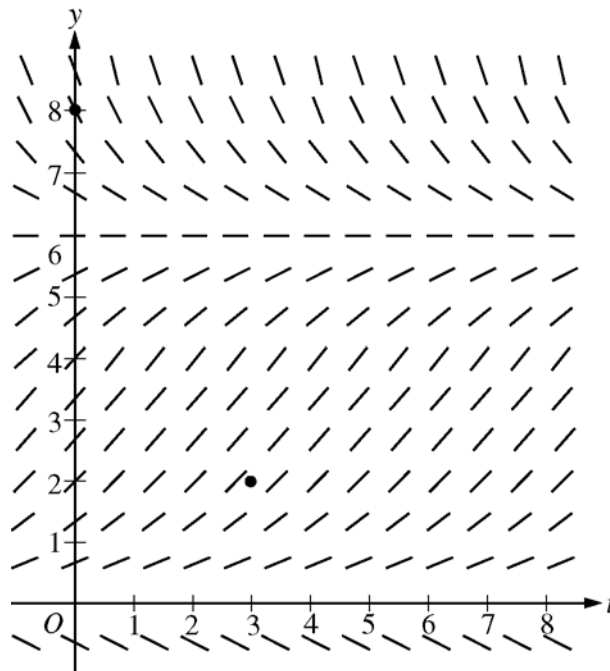
WRITE ALL WORK IN THE PINK EXAM BOOKLET.

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6. Consider the logistic differential equation $\frac{dy}{dt} = \frac{y}{8}(6 - y)$. Let $y = f(t)$ be the particular solution to the differential equation with $f(0) = 8$.

- (a) A slope field for this differential equation is given below. Sketch possible solution curves through the points $(3, 2)$ and $(0, 8)$.

(Note: Use the axes provided in the exam booklet.)



- (b) Use Euler's method, starting at $t = 0$ with two steps of equal size, to approximate $f(1)$.
- (c) Write the second-degree Taylor polynomial for f about $t = 0$, and use it to approximate $f(1)$.
- (d) What is the range of f for $t \geq 0$?

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END OF EXAM