Free Response Question 5
Calculator Permitted

Sally Sue had spent all day preparing for the prom. All the glitz and the glamour of the evening fell apart as she stepped out of the limousine and her heel broke and she fell to the ground. Within minutes, news of her crashing fall had begun to spread throughout the 525 people already at the prom. The function,

$$p(t) = 525(1 - e^{-0.038t}),$$

where t represents the number of minutes after the fall, models the number of people who were already at the prom who heard the news.

a. Find the value of $p(3.5)$. Using correct units, explain what this value represents in the context of this problem.

$p(3.5) = 65.381$ people +1

Three and a half minutes after falling, about 65 people knew of the fall. +1

b. Solve the equation $p(t) = 300$. Explain what the solution to this equation represents in the context of this problem. Show your work or explain what you did to get your answer.

+1 $300 = 525(1 - e^{-0.038t})$

$\frac{300}{525} = 1 - e^{-0.038t}$ $t \approx 22.297$ +1

$\frac{12}{21} - \frac{21}{21} = -e^{-0.038t}$

$\frac{-9}{12} = -e^{-0.038t}$

$\frac{3}{7} = e^{-0.038t}$

+1 $\ln(\frac{3}{7}) = -0.038t$

$\frac{\ln(\frac{3}{7})}{-0.038} = t$

About 22 minutes after falling, 300 people knew of the fall. +1

c. How many minutes does it take before all 525 people already at the prom to hear the news of the great fall? Show the algebraic analysis that leads to your answer.

$525 = 525(1 - e^{-0.038t})$ +1

$1 = 1 - e^{-0.038t}$

$0 = -e^{-0.038t}$

$0 = e^{-0.038t}$

$\ln 0 = -0.038t$

undefined

NO solution +1

At no time will everyone at prom hear about the fall. +1