

2001 Mathematics (1)

This pdf was generated from questions and answers contributed by members of the public to Christopher Lester's tripos/example-sheet solution exchange site <http://cgl20.user.srcf.net/>. Nothing (other than raven authentication) prevents rubbish being uploaded, so this pdf comes with no warranty as to the correctness of the questions or answers contained. Visit the site, vote, and/or supply your own content if you don't like what you see here.

This pdf had url <http://cgl20.user.srcf.net/camcourse/paperpdf/34?withSolutions=1>.

This pdf was created on Fri, 19 Apr 2024 06:01:15 +0000.

1A

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

2A

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

3B

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

4B*

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

5C

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

6C

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

7D

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

8D*

No image has yet been uploaded for this question
No solution has yet been submitted for this question.

9E

No image has yet been uploaded for this question

Solution(s):

From user: ar857

9E 2001 I

a) $\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} \dots$

b) $x \sqrt{x^2 + a^2} = x \cdot (x^2 + a^2)^{-1/2} = x \cdot (a^2 \cdot (\frac{x^2}{a^2} + 1))^{-1/2}$
 $= \frac{x}{a} \cdot (x^2/a^2 + 1)^{-1/2} = \frac{x}{a} \cdot (1 - \frac{1}{2} \frac{x^2}{a^2} + \frac{-1/2 \cdot -3/2}{2} \frac{x^4}{a^4})$
 $= \frac{x}{a} - \frac{1}{2} \frac{x^3}{a^3} + \frac{3}{8} \frac{x^5}{a^5}$

c) $e^{-(x-a)^2} = e^{-a^2} \cdot e^{-2ax} \cdot e^{x^2}$
 $= e^{-a^2} \cdot (1 - 2ax + \frac{(2ax)^2}{2!} - \frac{(2ax)^3}{3!} + \dots)$
 $= e^{-a^2} \cdot (1 - 2ax + (2a^2 - 1)x^2)$ ✓ (I don't understand your method)

d) $\ln \frac{1-x}{1+x^2} = \ln(1-x) - \ln(1+x^2) = -x - \frac{x^2}{2} - \frac{x^3}{3} - (2x^2) = -x - \frac{5}{2}x^2 - \frac{x^3}{3}$
 $= \lim_{n \rightarrow \infty} \frac{1}{n} \cdot (1 + \frac{1}{n}) (2 + \frac{1}{n}) = \frac{1}{6} \cdot 1 = \frac{1}{3}$
 $1 + (2xa - x^2) + \frac{(2xa - x^2)^2}{2}$

$e^{-(x-a)^2} = e^{-a^2} \cdot e^{-2ax} \cdot e^{x^2}$
 $= e^{-a^2} \cdot [1 + (2xa - x^2) + \frac{(2xa - x^2)^2}{2!} + \dots]$
 $= e^{-a^2} \cdot [1 + 2ax + (-1 + \frac{4a^2}{2})x^2 + \dots]$

10E*

No image has yet been uploaded for this question
 No solution has yet been submitted for this question.

11F

No image has yet been uploaded for this question
 No solution has yet been submitted for this question.

12F

No image has yet been uploaded for this question
 No solution has yet been submitted for this question.