FAC

Corrections to 2016 study material

Comment

This document contains details of any errors and ambiguities in the FAC study materials for 2016 that have been brought to our attention. We will incorporate these changes in the study material each year. We are always happy to receive feedback from students, particularly details concerning any errors, contradictions or unclear statements in the courses. If you have any such comments on this course please email them to FAC@bpp.com.

Important note

This document was last revised significantly on 28th September 2015. The date on which any corrections have been added is noted at the start of each section.

Q&A Bank

Question A123 Page 49 (updated on 28th September 2015)

The question is wrong as all the solutions converge. The current answer says B does not converge whereas $x \ln x \to 0$ as $x \to 0$.

A replacement question would be:

Which of the following does NOT converge?

A $\int_1^\infty e^{-2x} dx$

B $\int_0^1 \frac{1}{x} dx$

C $\int_1^\infty x^{-2} dx$

D $\int_1^\infty \frac{6}{x^3} dx$

Replacement pages can be found at the end.

Question A123

Which of the following does NOT converge?

A $\int_1^\infty e^{-2x}dx$

B $\int_0^1 \frac{1}{x}\,dx$

C $\int_1^\infty x^{-2}dx$

D $\int_1^\infty \frac{6}{x^3}dx$ [1]

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Question A124

Using the trapezium rule and 7 ordinates, what is the approximate area under the curve $y=(7-x)^2$ between $x=1$ and $x=4$?

A 40.1875
B 63.125
C 80.375
D 138.25 [2]

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Question A125

If e^x is expanded to its fourth term, using the Maclaurin expansion $f(x)=f(0)+f'(0)x+\frac{f''(0)}{2!}x^2+\cdots$, what is the value of e^2 based on this?

A 5
B 6.333
C 7.389
D 7.667 [2]

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Question A126

Which of the following is the correct first five terms of the Taylor expansion of $\ln\left[(3+x)(3+y)\right]$ about $(0,0)$? You are given that the Taylor's expansion of $f(x,y)$ about (a,b) is:

$$f(x,y) = f(a,b) + \frac{1}{1!}\left[\left.\frac{\partial f}{\partial x}\right|_{(a,b)}(x-a) + \left.\frac{\partial f}{\partial y}\right|_{(a,b)}(y-b)\right]$$

$$+\frac{1}{2!}\left[\left.\frac{\partial^2 f}{\partial x^2}\right|_{(a,b)}(x-a)^2 + 2\left.\frac{\partial^2 f}{\partial x \partial y}\right|_{(a,b)}(x-a)(y-b) + \left.\frac{\partial^2 f}{\partial y^2}\right|_{(a,b)}(y-b)^2\right]$$

$$+\cdots$$

A $\ln 9 + \frac{1}{3}x + \frac{1}{3}y - \frac{1}{18}x^2 - \frac{1}{18}y^2$

B $\ln 9 + \frac{1}{3}x + \frac{1}{3}y - \frac{1}{9}x^2 - \frac{1}{9}y^2$

C $\ln 9 + \frac{1}{3}x + \frac{1}{3}y + \frac{1}{9}x^2 + \frac{1}{9}y^2$

D $\ln 9 + \frac{1}{3}x + \frac{1}{3}y + \frac{1}{18}x^2 + \frac{1}{18}y^2$ [5]

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Question A127

Given that $\frac{dy}{dx} = \frac{y}{3x+1}$, $y = e^2$ when $x = 0$, what is the value of y when $x = 2$?

A 51.723
B 7
C 14.135
D 6 [2]

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Solution A120

D

Using integration by parts gives:

$$\int_0^1 xe^{2x}\,dx = \left[\tfrac{1}{2}xe^{2x}\right]_0^1 - \int_0^1 \tfrac{1}{2}e^{2x}\,dx$$

$$= \tfrac{1}{2}e^2 - \left[\tfrac{1}{4}e^{2x}\right]_0^1$$

$$= \tfrac{1}{2}e^2 - \tfrac{1}{4}e^2 + \tfrac{1}{4}$$

$$= 2.097$$

Solution A121

D

Using Leibniz's formula gives:

$$\frac{d}{dx}\int_0^x 3x^2 - 2t\,dt = 1\left(3x^2 - 2t\right)\Big|_{t=x} - 0 + \int_0^x \frac{\partial}{\partial x}\left(3x^2 - 2t\right)dt$$

$$= (3x^2 - 2x) + \int_0^x 6x\,dt$$

$$= (3x^2 - 2x) + \left[6xt\right]_0^x$$

$$= (3x^2 - 2x) + 6x^2$$

$$= 9x^2 - 2x$$

Solution A122

A

$$\int_{x=5}^{15}\int_{y=5}^{10}(5x+y)\,dy\,dx=\int_{x=5}^{15}\left[5xy+0.5y^2\right]_{y=5}^{10}dx$$

$$=\int_{x=5}^{15}25x+37.5\,dx$$

$$=\left[12.5x^2+37.5x\right]_{x=5}^{15}$$

$$=2{,}875$$

Solution A123

B

Using integration we get:

$$\int_0^1\frac{1}{x}\,dx=\left[\ln x\right]_0^1$$

But $\ln x$ is undefined when $x=0$.

The alternatives all converge:

$$\int_1^\infty e^{-2x}dx=\left[-\tfrac{1}{2}e^{-2x}\right]_1^\infty=0-(-\tfrac{1}{2})=\tfrac{1}{2}$$

$$\int_1^\infty x^{-2}dx=\left[-x^{-1}\right]_1^\infty=0-(-1)=1$$

$$\int_1^\infty\frac{6}{x^3}dx=\left[-\frac{3}{x^2}\right]_1^\infty=0-(-3)=3$$