Test 2 Solutions

Fundamentals of Calculus II

Name: Senior/Seniorita Correcto/a!

True or False. No justification necessary.

1. T The integral of $\frac{1}{x}$ with respect to x is $\ln|x| + C$.

2. F $\int e^{3x}\,dx = e^{3x} * 3 + C$

3. F (a,b) is a relative max if $D = f_{xx}f_{yy} - (f_{yx})^2 < 0$.

4. T Double integrals yield the volume under a surface.

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$$f(x,y) = x^2 y + 15x$$

Evaluate the expressions below.No justification necessary.

5. $\int x(f(x,y))^{99}\,dx$ DISREGARD
   Ideally, I hoped to see: you can't relate the rate of change of u to that of x.

6. Find f_x 2xy + 15

7. What are the critical points of $f(x,y)$? $2xy + 15 = 0$ and $x^2 = 0$, meaning no values for x, y satisfy the equations. Therefore, there are no critical points.

8. $\int_{y=0}^{y=1} f(x,y)\,dy = x^2/2 + 15x$

9. $\int_{y=0}^{y=2} \int_{x=0}^{x=1} f(x,y)\,dx\,dy = 47/3$ (remember, use any order you'd like)

10. $\int_0^{\infty} e^{-7x}\,dx = 1/7$.

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Respond to the questions below.
Explain and justify your thought process.

11. For $\int u(x)v'(x)dx$, state the integration by parts technique.
    $\int u(x)v'(x)dx = u(x)v(x) - \int v(x)u'(x)dx$

12. Explain why this technique works.
    product rule

13. Use integration by parts to solve $\int x^2 ln(x)\, dx$.
    $u = ln(x), dv = x^2$
    Then, $\frac{du}{dx} = 1/x$ and $v = x^3/3$.
    By integration by parts we can simplify the integral to

    $$\int x^2 ln(x)\, dx = ln(x)x^3/3 - \int x^2/3\, dx$$

    yielding $\frac{x^3}{3} ln(x) - \frac{x^3}{9} + C$.

14. State one application of double integrals or partial derivatives.
    your favorite real-world application is perfect!

15. What's your favorite part of the course so far?
    I ♡ Calculus II