Final Exam, Part I: Skills and Concepts

This exam is closed book, closed note. No collaboration. You are encouraged to use an approved calculator. Each question has exactly one correct answer; no credit will be awarded for any question with two answers marked. This exam is scantron graded, so please fill in the scantron sheet carefully with a number 2 pencil. You are free to use scratch paper, but only your scantron sheet will be graded.

1. To sum $\sum_{n=0}^{\infty} 4^{n+2}(2^{-3n})$ you could correctly rewrite it as

a. $\sum_{n=1}^{\infty} \frac{4^2+4^n}{8^n}$ b. $8\sum_{n=1}^{\infty} (\frac{1}{2})^n$ c. $\sum_{n=0}^{\infty} 4(\frac{4}{2^3})^n$ d. $\sum_{n=0}^{\infty} 16(\frac{1}{2})^n$

2. $(\sec\theta+\tan\theta)(1-\sin\theta)=$__________

a. $\cot\theta$ b. $\cos\theta$ c. $\tan\theta$ d. $\csc\theta$

3. The area bounded by $y=x^3-6x^2+9x$ and $y=x^2-3x$ is given by

a. $\frac{1}{4}x^4-\frac{7}{3}x^3+6x^2+\frac{7}{3}x^3-6x^2-\frac{1}{4}x^4 \,\Big|_0^4$

b. $(\frac{1}{4}x^4-\frac{7}{3}x^3+6x^2)\,\Big|_0^2 + (\frac{7}{3}x^3-6x^2-\frac{1}{4}x^4)\,\Big|_2^4$

c. $(\frac{1}{4}x^4+\frac{7}{3}x^3+6x^2)\,\Big|_0^3 + (\frac{7}{3}x^3+6x^2-\frac{1}{4}x^4)\,\Big|_2^3$

d. $(\frac{1}{4}x^4-\frac{7}{3}x^3+6x^2)\,\Big|_0^3 + (\frac{7}{3}x^3-6x^2-\frac{1}{4}x^4)\,\Big|_3^4$

4. To evaluate $\int \frac{\ln(x)}{x^3}dx$, you could correctly rewrite it as

a. $\frac{-\ln(x)}{2x^2}+\int \frac{1}{2x^3}dx$ b. $\frac{-3\ln(x)}{x^4}+\int \frac{3}{2x^5}dx$ c. $\frac{\ln(x)}{4}x^4-\int \frac{1}{4}x^3dx$

d. $-\frac{\ln(x)}{4}x^4+\int \frac{1}{4}x^3dx$

5. If $Z=\sin(y)e^{\cos(x)}+\ln(xy)$ then the total differential of Z is given by

a. $dZ=(\sin(y)e^{\cos(x)}+\ln(xy))dxdy$

b. $dZ=(-\sin(y)\sin(x)e^{\cos(x)}+\frac{1}{x})dx+(\cos(y)e^{\cos(x)}+\frac{1}{y})dy$

c. $dZ=(-\sin(x)e^{\cos(x)}+\frac{y}{x})dx+(\cos(y)e^{\cos(x)}+\frac{x}{y})dy$

d. $dZ=(\sin(y)\cos(x)e^{\cos(x)-1}+\frac{y}{x})dx+(\cos(y)e^{\cos(x)}+\frac{x}{y})dy$

6. To find the line of best fit through (1,2), (3, 5), and (4, 3) you would solve the following system of equations:

a. $\begin{array}{l}26m+8b=29\\8m+3b=10\end{array}$ b. $\begin{array}{l}27m+8b=29\\5m+3b=10\end{array}$ c. $\begin{array}{l}26m+7b=29\\8m+3b=11\end{array}$ d. $\begin{array}{l}26m+8b=29\\8m+3b=11\end{array}$

7. Evaluate $\int_2^3\int_0^{y^2}(x+2y)dxdy$

a. 42.7 b. 24.9 c. 87.2 d. 53.6

8. Evaluate $\int_0^{\infty} 3xe^{-x^2}dx$

a. 4/5 b. ½ c. 0 d. 3/2

9. evaluate $\int (x^2 + 2x + 1)dx$

a. $2x + 2 + c$ b. $x^3 + \frac{1}{2}x^2 + x + c$ c. $\frac{1}{3}x^3 + x^2 + x + c$

d. $\frac{1}{3}x^3 + x^2 + x$

10. Approximate $\int_0^6 e^{x^2} dx$ using the trapezoidal rule with n=3.

a. $2(e^0 + 2e^4 + 2e^9 + 2e^{16} + 2e^{25} + e^{36})$

b. $1 + 2e^4 + 2e^9 + 2e^{16} + 2e^{25} + e^{36}$

c. $\frac{6-0}{2*2}(0 + 2(1) + 2(2) + 2(3) + 2(4) + 2(5) + 6)$

d. $\frac{6-0}{2}(0 + 2(1) + 2(2) + 2(3) + 2(4) + 2(5) + 6)$

11. If $f(x, y) = y\sin(x) + 2yx$ then $f_x(0,1) =$ _____

a. 1 b. 3 c. π/3 d. $\frac{1}{\sqrt{2}}$

12. The fundamental theorem of calculus states

a. $\int_a^b f(x)dx = F(x) + c$ b. $\int_a^b f(x)dx = F(a) - F(b)$

c. $\int_a^b f(x)dx = F(b) - F(a)$ d. $\int_a^b f(x)dx = f'(b) - f'(a)$

13. $$\lim_{n\to\infty}\left\{\frac{\frac{1}{n+1}+2e^{n^{-1}}}{2e^{-n}+1}\right\}=$$

a. 0 b. ∞ c. 2 d. 1

14. If you wanted to find the maximum and minimum values of $f(x,y)=xy^2$ subject to the constraint $x^2+y^2=1$, your auxiliary function would be

a. $F(x,y,\lambda)=y^2+2yx+\lambda x^2+\lambda y^2$ b. $F(x,y,\lambda)=xy^2+\lambda x^2+\lambda y^2-\lambda$

c. $F(x,y,\lambda)=xy^2-\lambda x^2+\lambda y^2+\lambda$ d. $F(x,y,\lambda)=(xy^2)(x^2+\lambda y^2)$

15. A critical point of the function $f(x,y)=x^2-y^2-2x+4y+1$ is

a. (2,3) b. (1,2) c. (2, 1) d. (0,1)

16. Evaluate $\displaystyle\int_0^{\pi/3}\sin(x)\cos(x)dx$

a. $\frac{1}{2}\sec(\frac{\sqrt{3}}{2})^2+c$ b. $\frac{1}{2}(\frac{\sqrt{3}}{2})^2$ c. $\frac{1}{2}\sin(\frac{\sqrt{3}}{2})^2$ d. $\frac{1}{2}\cos(\frac{\sqrt{3}}{2})^2$

17. $\displaystyle\int_{-3}^{7}(x^3+2)dx$ is

a. Equal to the area bounded between the graph of $f(x)=x^3+2$ and the x-axis on the interval [-3,7].

b. Greater than the area bounded between the graph of $f(x)=x^3+2$ and the x-axis on the interval [-3,7].

c. Less than the area bounded between the graph of $f(x)=x^3+2$ and the x-axis on the interval [-3,7].

d. 4

18. Which of the following series diverges?

a. $\sum_{n=0}^{\infty} \frac{1}{n+1} - \frac{1}{n+2}$ b. $\sum_{n=0}^{\infty} \frac{1}{2^n}$ c. $\sum_{n=0}^{\infty} 4(\frac{e}{\pi})^n$ d. $\sum_{n=0}^{\infty} n!$

19. The purpose of Simpson's rule is to

a. differentiate trigonometric functions
b. sum infinite series
c. annoy calculus students
d. approximate definite integrals

20. If $f(x,y) = yx^2 + yx$ then f(1,2)=

a. 4 b. 5 c. 3 d. 0