

Calculus I
Review for Test 4
Luczak

Evaluate the following indefinite integrals. Leave no negative exponents or compound fractions.

1. $\int \sqrt[3]{x^2} \left(\frac{1}{x} - x^3 \right) dx =$

2. $\int \frac{\cos^3 x}{2 - 2\sin^2 x} dx =$

3. $\int \left(\frac{2x-3}{x} - e^{2x} \right) dx =$

4. $\int \frac{e^x}{1+e^x} dx =$

5. $\int \frac{1}{x^2 e^{\frac{x}{2}}} dx =$

6. $\int 3 \tan^3 4x \sec^2 4x dx =$

7. $\int \frac{x}{\sqrt{x-1}} dx =$

8. $\int \frac{(\ln x)^5}{x} dx =$

9. $\int \frac{8x^2 + 9x + 8}{1+x^2} dx =$

10. $\int \frac{\sin^2 x + \cos^2 x}{\sin x} dx =$

$$11. \int \coth^5(x+1) \operatorname{csch}^2(x+1) dx =$$

$$12. \int \frac{dx}{\sqrt{8+2x-x^2}} =$$

$$13. \text{ Find } f(x) \text{ if } f''(x) = x^2, f'(0) = 7 \text{ and } f(0) = 2.$$

$$14. \text{ Find } f'(x) \text{ for the following:}$$

$$a) f(x) = e^{\sinh x^2}$$

$$b) f(x) = \sinh^4 2x \cosh^3 2x$$

Evaluate the following definite integrals using the Fundamental Theorem of calculus. Give exact answers. Do NOT give decimal approximations!! If decimal approximations are given NO credit will be awarded.

$$15. \int_0^{\pi} \sin \frac{x}{2} \cos \frac{x}{2} dx =$$

$$16. \int_{-\frac{1}{\sqrt{3}}}^{\frac{1}{\sqrt{3}}} \frac{3}{\sqrt{4-9x^2}} dx =$$

$$17. \int_0^{\ln 3} \frac{e^x}{\sqrt{e^x+1}} dx =$$

$$18. \int_{\frac{e}{2}}^{\frac{e^3}{2}} \frac{\ln 2x}{x} dx =$$

$$19. \int_2^3 \frac{x^3}{x^4-3} dx =$$

20. Find the area bounded by $y = x^2 - 4$, $x = -3$, $x = 3$ and the x axis.

21. Find the area bounded by: $f(x) = 2^x$, $x = -2$, and $x = 1$.

22. TRUE or FALSE: The average value of $f(x) = x^3$ over the interval $[-3, 3]$ is $\frac{27}{4}$.

Explain.

23. TRUE or FALSE: $\int x^2 e^x dx = \left(\frac{1}{3} x^3 e^x\right) + C$. Explain.

24. Given $\int_0^9 f(x) dx = 5$ and $\int_3^9 f(x) dx = -1$, find

a) $\int_0^3 f(x) dx =$ _____

b) $\int_9^0 f(x) dx =$ _____

25. Prove **ONE** of the following. Circle the one you wish to have graded.

a) $\int \csc x dx = \ln |\csc x - \cot x| + c$

b) $\int \cot x dx = \ln |\sin x| + C$

c) $\int \sec x dx = \ln |\sec x + \tan x| + C$

26. Calculate the following sums:

a) $\sum_{k=0}^3 \frac{1}{k^2 + 1} =$ _____

b) $\sum_{k=1}^4 \frac{(-1)^{k+1}}{k} =$ _____