Worksheet 32

Warm-up questions

If k is a constant, $\int k\,dx =$

If $n \neq -1$, $\int x^n\,dx =$

$\int \frac{1}{x}\,dx =$

$\int \sin(x)\,dx =$

$\int \cos(x)\,dx =$

$\int e^x\,dx =$

Problem 0. Find the following indefinite integrals.

(a) $\int \frac{8}{\sqrt{u}}\,du$

(b) $\int e^x + x^e\,dx$

(c) $\int 2 + \cos t\,dt$

(d) $\int 7e^x dx$

(e) $\int (x+3)^2 dx$

(f) $\int t^3(t^2+1)dx$

(g) $\int \frac{x+1}{x}dx$

(h) $\int \sqrt{x^3} - \frac{2}{x}dx$

(i) $\int 4t + \frac{1}{t}dt$

(j) $\int \sin(3x)dx$

Problem 1. Evaluate the definite integrals exactly using the Fundamental Theorem of Calculus.

(a) $\int_0^3 \left(x^2 + 4x + 3\right)\,dx$

(b) $\int_0^{\frac{\pi}{4}} \sin\theta\,d\theta$

(c) $\int_0^2 3e^t\,dt$

(d) $\int_1^2 \frac{1+y^2}{y}\,dy$

Problem 2 (Winter 2016 Final Exam Problem 10)**.** Which of the following is an antiderivative of the function $f(x) = \cos(x)$? Circle all the correct options.

(a) $\frac{\cos(x)}{2}$

(b) $\sin(x) + 5$

(c) $\cos\left(x - \frac{\pi}{2}\right)$

(d) $\ln\left(3e^{\sin(x)}\right)$

(e) $19 - \sin(x)$

(f) None of these

Problem 3 (Fall 2017 Final Exam Problem 9)**.** Which of the following is an antiderivative of the function $f(x) = \frac{1}{x} + \cos(x)$? Circle all the correct options.

(a) $-\frac{1}{x^2} - \sin(x)$

(b) $\ln(5x) + \sin(x)$

(c) $\ln(x) + \sin(x) - 20$

(d) $\ln\left(\frac{1}{x}\cos(x)\right)$

(e) $\frac{1}{x^2} + \sin(x)$

(f) None of these

Problem 4 (Winter 2013 Final Exam Problem 9)**.** The number p is a constant. Which of the following is an antiderivative of $g(x) = \ln(x+p)$?

(a) $G(x) = \frac{p}{x+p}$.

(b) $G(x) = \frac{1}{x+p}$.

(c) $G(x) = (x+p)\ln(x+p) - x$.

(d) $G(x) = \frac{\ln(x+p)}{p} - x$.

(e) $G(x) = x^2\ln(x+p) - x$.

Problem 5 (Winter 2015 Final Exam Problem 11)**.** Suppose that w and r are continuous functions on $(-\infty, \infty)$, $W(x)$ is an invertible antiderivative of $w(x)$, and $R(x)$ is an antiderivative of $r(x)$. Which of the following statements must be true?

(a) $W(x) + R(x) + 2$ is an antiderivative of $w(x) + r(x)$.

(b) $W(x) + R(x) + 2$ is an antiderivative of $w(x) + r(x) + 2$.

(c) $\cos(W(x))$ is an antiderivative of $\sin(w(x))$.

(d) $e^{W(x)}$ is an antiderivative of $w(x)e^{w(x)}$.

(e) $e^{R(x)}$ is an antiderivative of $r(x)e^{R(x)}$

(f) If w is never zero, then $W^{-1}(R(x))$ is an antiderivative of $\frac{r(x)}{w(W^{-1}(R(x)))}$.

(g) None of these