28. $\int_1^{500}\left(13^x - 11^x\right)dx + \int_2^{500}\left(11^x - 13^x\right)dx =$

(A) 0.000 (B) 14.946 (C) 34.415 (D) 46.000 (E) 136.364

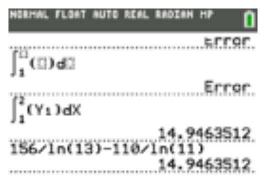
$$\int_1^{500} 13^x - 11^x\,dx + \int_{500}^{2} -11^x + 13^x\,dx$$

$$\frac{d}{dx}\left(13^x\right) = 13^x \ln 13$$

$$= \int_1^2 13^x - 11^x\,dx$$

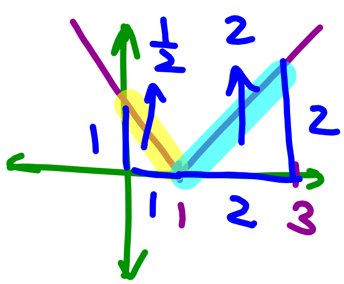
$$= \left.\frac{13^x}{\ln 13} - \frac{11^x}{\ln 11}\right]_1^2 = \left(\frac{13^2}{\ln 13} - \frac{11^2}{\ln 11}\right) - \left(\frac{13}{\ln 13} - \frac{11}{\ln 11}\right)$$

$$= \frac{156}{\ln 13} - \frac{110}{\ln 11}$$



27. $\int_0^3 |x-1|\,dx =$ $\int_0^1 1 - x\,dx + \int_1^3 x - 1\,dx$

(A) 0 (B) $\frac{3}{2}$ (C) 2 (D) $\frac{5}{2}$ (E) 6



$$|x-1| = \begin{cases} x-1, & x \geq 1 \\ -(x-1), & x < 1 \end{cases}$$

29. $\int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x}\,dx =$

(A) $\ln\sqrt{2}$ (B) $\ln\frac{\pi}{4}$ (C) $\ln\sqrt{3}$ (D) $\ln\frac{\sqrt{3}}{2}$ (E) $\ln e$

$u = \sin x$

$du = \cos x\,dx$

$$\int_{\sqrt{2}/2}^{1} \frac{du}{u} = \ln u \Big]_{\sqrt{2}/2}^{1} = \ln 1 - \ln\frac{\sqrt{2}}{2}$$

$$= -\ln\frac{\sqrt{2}}{2}$$

$$= \ln\left(\frac{\sqrt{2}}{2}\right)^{-1} = \ln\left|\frac{2}{\sqrt{2}}\right| = \ln\sqrt{2}$$

38. If $\int_1^2 \boxed{f(x-c)}\,dx = 5$ where c is a constant, then $\int_{1-c}^{2-c} \boxed{f(x)}\,dx =$

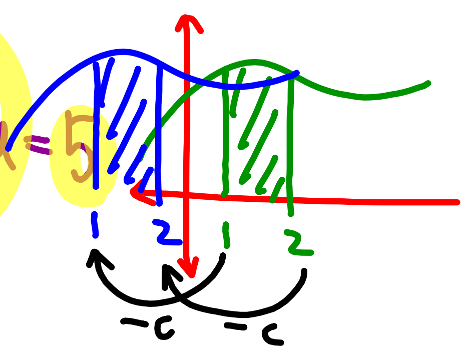
Let $x \to x+c$

(A) $5+c$ (B) 5 (C) $5-c$ (D) $c-5$ (E) -5

$u = x - c$

$du = dx$

$$\int_{1-c}^{2-c} f(u)\,du = 5$$



32. $\int \frac{5}{1+x^2}\,dx =$ $5\int \frac{1}{1+x^2}\,dx = 5\arctan x + C$

(A) $\frac{-10x}{\left(1+x^2\right)^2}+C$

(B) $\frac{5}{2x}\ln\left(1+x^2\right)+C$

(C) $5x-\frac{5}{x}+C$

(D) $5\arctan x+C$

(E) $5\ln\left(1+x^2\right)+C$

$C + \arctan x = \int \frac{1}{1+x^2}\,dx$

40. If n is a non-negative integer, then $\int_0^1 x^n\,dx = \int_0^1 (1-x)^n\,dx$ for

(A) no n

(B) n even, only

(C) n odd, only

(D) nonzero n, only

(E) all n

$\int_0^1 u^n\,du = -\int_1^0 u^n\,du$

$u = 1-x$

$du = -dx$