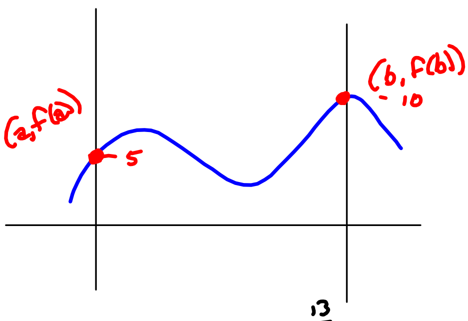
Net Change Theorem

$$\int_a^b f'(t)\,dt = f(b) - f(a)$$



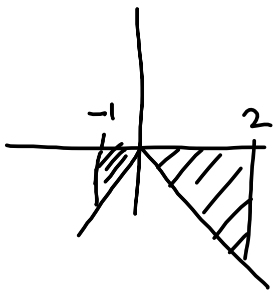
$$\int \sqrt[6]{x^7}\,dx = \int x^{\frac{7}{6}}\,dx = \frac{x^{\frac{13}{6}}}{\frac{13}{6}} + C = \frac{6}{13}x^{\frac{13}{6}} + C$$

$$\int_{-1}^{2}(x-8|x|)\,dx = \int_{-1}^{0}(x-8(-x))\,dx + \int_{0}^{2}(x-8x)\,dx$$

$$|x| = \begin{cases} x & \text{if } x \ge 0 \\ -x & \text{if } x < 0 \end{cases}$$

$$= \int_{-1}^{0} 9x\,dx + \int_{0}^{2} -7x\,dx$$

$$= \frac{9}{2}x^2\Big]_{-1}^{0} - \frac{7}{2}x^2\Big]_{0}^{2}$$



$$= \frac{9}{2}\left[0^2-(-1)^2\right] - \frac{7}{2}\left[2^2-0^2\right]$$

$$= \frac{9}{2}[-1] - \frac{7}{2}[4] = -\frac{9}{2} - \frac{28}{2} = \boxed{-\frac{37}{2}}$$

When is the re-do of the Take-Home due?

Monday after Turkey Day!

#s 19/20 in 4.3?

$$\int_a^b = \int_a^0 + \int_0^b = -\int_0^a + \int_0^b$$

Find the derivative of the function.

$$g(x) = \int_{5x}^{7x} \frac{u^2 - 4}{u^2 + 4}\,du \qquad \left[\text{Hint: } \int_{5x}^{7x} f(u)\,du = \int_{5x}^{0} f(u)\,du + \int_{0}^{7x} f(u)\,du\right]$$

$$g(x) = -\int_0^{5x} \frac{u^2-4}{u^2+4}\,du + \int_0^{7x} \frac{u^2-4}{u^2+4}\,du$$

$$-\left(\frac{(5x)^2-4}{(5x)^2+4}\right)(5) + \left(\frac{(7x)^2-4}{(7x)^2+4}\right)(7)$$

$$\int_{\sec(x)}^{5x^2} \frac{t}{\sqrt{t^2-7}}\,dt = \int_{\sec(x)}^{0} + \int_0^{5x^2} = -\int_0^{\sec(x)} \frac{t}{\sqrt{t^2-7}}\,dt$$

$$+\int_0^{5x^2} \frac{t}{\sqrt{t^2-7}}\,dt = -\frac{\sec(x)}{\sqrt{\sec^2(x)-7}} + \frac{5x^2}{\sqrt{(5x^2)^2-7}}$$

$\tan^2(x) = \tan(x)^2$ in WebAssign

20. 0/1 points SCalc9 4.4.065. [4709154]

The linear density of a rod of length 4 meters is given by $\rho(x) = 5 + 2\sqrt{x}$ measured in kilograms per meter, where x is measured in meters from one end of the rod. Find the total mass (in kg) of the rod.

$$\int_0^4 \left(2x^{\frac{1}{2}}+5\right)dx = \left[\frac{4}{3}x^{\frac{3}{2}} + 5x\right]_0^4 = \frac{4}{3}(8) + 5(4) - (0+0)$$

$$\frac{32}{3} + \frac{60}{3} = \frac{92}{3} \text{ Kg}$$

$$\frac{e^x+e^{-x}}{2} + \frac{e^x+e^{-x}}{2} = \frac{2e^x}{2} = e^x$$

$$\sinh(x) = \frac{e^x - e^{-x}}{2}$$

$$\cosh(x) = \frac{e^x + e^{-x}}{2}$$

Evaluate the integral.

$$\int_{-7}^{7} \frac{6e^x}{\sinh(x) + \cosh(x)}\, dx$$

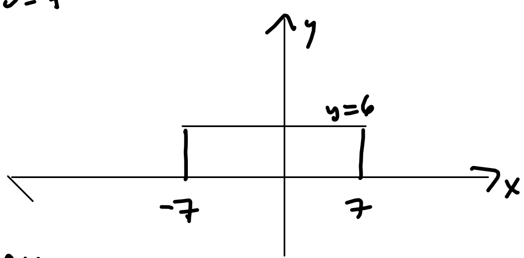
$$\sin(x) = \frac{e^{ix} - e^{-ix}}{2}$$

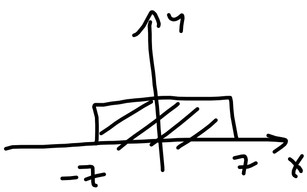
$$\cos(x) = \frac{e^{ix} + e^{-ix}}{2}$$

$$= \int_{-7}^{7} \frac{2\cdot 6e^x}{e^x - e^{-x} + e^x + e^{-x}}\, dx$$

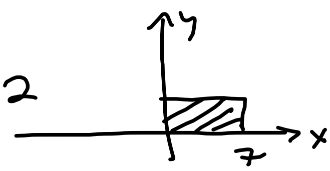
$$= \int_{-7}^{7} \frac{12e^x}{2e^x}\, dx = \int_{-7}^{7} 6\, dx = 2\int_0^7 6\, dx = 2\left[7x\right]_0^7$$

$$= 98$$





$= 2$



$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} = \frac{n^2+n}{2} = \frac{n^2+\text{smaller}}{2} = \frac{n^2+\sim}{2} \quad \boxed{8}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{2n^3+\sim}{6} = \frac{n^3+\sim}{3} \quad \boxed{9}$$

$$\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2 = \frac{n^4+\sim}{4} \quad \boxed{10}$$

$$\sum_{i=1}^{n} c = nc$$

$$\sum_{i=1}^{n} ca_i = c\sum_{i=1}^{n} a_i$$

$$\sum_{i=1}^{n} (a_i+b_i) = \sum_{i=1}^{n} a_i + \sum_{i=1}^{n} b_i$$

$$\sum_{i=1}^{n} (a_i-b_i) = \sum_{i=1}^{n} a_i - \sum_{i=1}^{n} b_i \quad \boxed{11}$$

$$\int_0^2 x^3\,dx = \left.\frac{x^4}{4}\right]_0^2 = \frac{16}{4} = 4$$

$$\frac{b-a}{n} = \Delta x = \frac{2-0}{n} = \frac{2}{n}$$

$$x_k = a + k(\Delta x) = a + \frac{2k}{n} = 0 + \frac{2k}{n} = \frac{2k}{n}$$

$$\Delta x \sum f(x_k) = \frac{2}{n}\sum_{k=1}^{n}\left(\frac{2k}{n}\right)^3 = \frac{2}{n}\sum_{k=1}^{n}\frac{8k^3}{n^3} = \frac{16}{n^4}\sum_{k=1}^{n} k^3$$

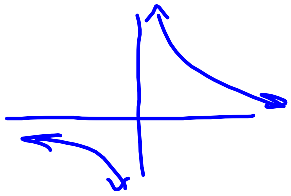
$$= \frac{16}{n^4}\left[\frac{n^4+\sim}{4}\right] = 4\left[\frac{n^4+\sim}{n^4}\right] \xrightarrow{n\to\infty} 4[1]$$

$$\frac{n^4+27n^3+11n^2+500n+20512}{n^4}$$

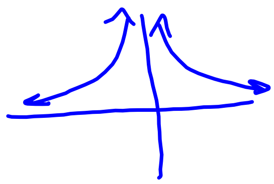
$$= \frac{n^4}{n^4} + \frac{27n^3}{n^4} + \frac{11n^2}{n^4} + \frac{500n}{n^4} + \frac{20512}{n^4}$$

$$\frac{27}{n},\ \frac{500}{n^3}$$

$$= 1 + \frac{27}{n}\to 0 + \frac{11}{n^2}\to 0 + \frac{500}{n^3}\to 0 + \frac{20512}{n^4}\to 0$$



$$\xrightarrow{n\to\infty} 1$$



$$\frac{n^4+27n^3+11n^2+500n+20512}{n^4}$$

$$= \frac{\cancel{n^4}\left(1+\frac{27}{n}+\frac{11}{n^2}+\frac{500}{n^3}+\frac{20512}{n^4}\right)}{\cancel{n^4}}$$

$$= 1 + \frac{27}{n} + \dots \xrightarrow{n\to\infty} 1$$

$$\frac{\text{Finite}}{\text{Infinite}} \text{ " = " } 0$$