$y = 2\sin\frac{\pi}{10}t$ and $x = 2 + 2t - 2\cos\frac{\pi}{10}t$ Find the area with the curve between

$t = 0$ and $t = 10$

Find the area bounded by the curve

$A = \int_a^b y\,dx$

$A = \int_0^{10} 2\sin\frac{\pi}{10}t\,dx$

$x = 2 + 2t - 2\cos\frac{\pi}{10}t$

$dx/dt = 2 + \frac{\pi}{5}\sin\frac{\pi}{10}t$

$dx = 2 + \frac{\pi}{5}\sin\frac{\pi}{10}t\,dt$

$A = \int_0^{10} 4\sin\frac{\pi}{10}t + \frac{2\pi}{5}\sin\frac{\pi}{10}t\,dt$

$A = 2\left(-\frac{20}{\pi}\cos\left(\frac{\pi}{10}t\right) - 2\cos\frac{\pi}{10}t\right]_0^{10}$

$A = \left(-\frac{40}{\pi}\cos\left(\frac{\pi}{10}t\right) - 4\cos\frac{\pi}{10}t\right]_0^{10}$

$A = -8.73 - 8.73$

$A = -17.46$ units

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1. $y = 3e^{2x}$ and $y = 3e^{-x}$ at the points $x=1$ and $x=2$

Find the area bounded by the curves

Solution.

$\int_a^b f(x) - g(x)\,dx$ where $f(x) = 3e^{2x}$ and $g(x) = 3e^{-x}$

$a = 1 \qquad b = 2$

$$A = \int_1^2 3e^{2x} - (3e^{-x})\,dx$$

$$A = \int_1^2 3e^{2x} - 3e^{-x} = 3\int_1^2 e^{2x} - e^{-x}$$

$$A = 3\left[\frac{e^{2x}}{2} + e^{-x}\right]_1^2$$

$$A = 3\left[\left(\frac{e^{2(2)}}{2} + e^{-2}\right) - \frac{e^{2(1)}}{2} + e^{-1}\right]$$

$$A = 3\left(\left(27.2 + 0.135\right] - 4.08\right]$$

$$A = 3(23.275]$$

$A = 69.823$ units² $\simeq 70$ units