: Area Under the Curve

e the area under the curve of the given information.

^{3} between 1 and 3 using 16 rectangles

LH: $\text{sum}(\text{seq}((x^3)(1/8), x, 1, 3-1/8, 1/8)) = 18.406$

RH: $\text{sum}(\text{seq}((x^3)(1/8), x, 1+1/8, 3, 1/8)) = 21.666$

Avg Area = $20.631 u^2$

^{2} + 2 between 1 and 4 using 100 rectangles

LH: $\text{sum}(\text{seq}((x^2+2)(3/100), x, 1, 4-3/100, 3/100)) = 26.775$

RH: $\text{sum}(\text{seq}((x^2+2)(3/100), x, 1+3/100, 4, 3/100)) = 27.225$

Avg Area $\approx 27 u^2$

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Definite Integrals

Definition of a Definite Integral:

e $\lim_{\Delta x \to 0} \sum_{i=1}^{n} f(x_i) \cdot \Delta x$ exists on the closed interval $[a,b]$, then f is integrable on $[a,b]$ a

$$\int_a^b f(x)\,dx = \lim_{\Delta x \to 0} \sum_{i=1}^{n} f(x_i) \cdot \Delta x$$

Fundamental Theorem of Calculus - Area

be continuous (hence integrable) on $[a,b]$ and let F be any antiderivative of f. Then

$$\int_a^b f(x)\,dx = F(x)\Big|_a^b = F(b) - F(a)$$

$\frac{81}{4} + C - \frac{1}{4} - C$

20

4

$x^3\,dx =$

$F(x) = \frac{1}{4}x^4 + C \Big|_1^3$

$F(3) - F(1)$

$\left(\frac{1}{4}\cdot 3^4 + C\right) - \left(\frac{1}{4}\cdot 1^4 + C\right)$

Lesson Problems

2) $\int_1^4 (x^2 + 2)\,dx =$

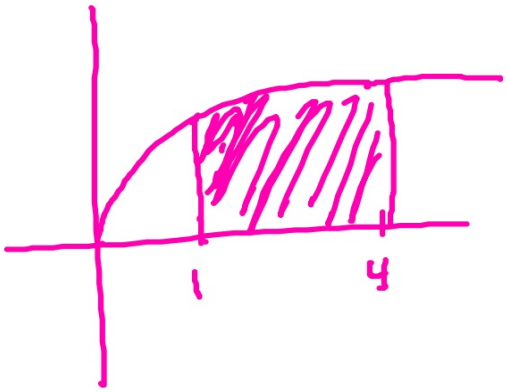
$F(x) = \frac{1}{3}x^3 + 2x \Big|_1^4$

$F(4) - F(1) = 27$

4) $\int_1^4 3\sqrt{x}\,dx = \int_1^4 3x^{1/2}\,dx$

$F(x) = 2x^{3/2}\Big|_1^4$

$Y_1(4) - Y_1(1) = 14$

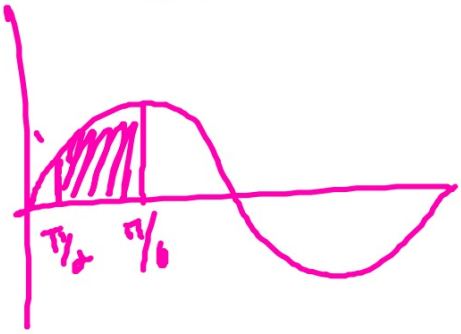


4) $\int_{\pi/6}^{\pi/2} \sin x\,dx$

$F(x) = -\cos(x)\Big|_{\pi/6}^{\pi/2}$

$F(\pi/2) - F(\pi/6)$

$= .866$



$\sqrt{x} - \frac{1}{\sqrt{x}} + \sqrt[3]{x}\Big) dx$

6) $\int_{-1}^{1} x^3 \left(1 + x^4\right)^3 dx$

$$\frac{x^2+2x}{\sqrt{x^3+3x^2+4}}\,dx$$

8) $\int_{2\pi}^{3\pi} 3\cos^2(2x)\sin(2x)\,dx$

ıte the area that is above the x-axis and below the curve of $y = -x^2 + x + 6$.

ıe graph and shade the area.

late the area between the given limits, the calculate the total amount of area (treat as positive) for the graph of $y = x^3 - 6x + 2$ from $x = 1$ and $x = 3$. Sketch the d shade the area under the curve.