Name: ____ Period: ___________ Date: _______________

AREA UNDER A CURVE Exit Quiz

Find the area between each curve and the x-axis for the given interval and subinterval using middle sum.

1. $y = 6x^2$ from $x = 1$ to $x = 2, \mathrm{n} = 5$

2. $y = \sqrt{1 - x^2}$ from $x = -1$ to $x = 1, \mathrm{n} = 4$

3. $y = 2x - 1$ from $x = 1$ to $x = 5, \mathrm{n} = 10$

4. $y = \frac{12x^2+5}{10}$ from $x = -4$ to $x = 3, \mathrm{n} = 7$

5. $y = 1 + \frac{1}{x}$ from $x = 1$ to $x = 3, \mathrm{n} = 8$

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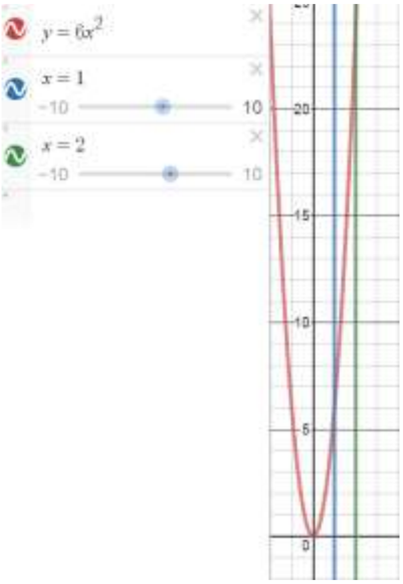
AREA UNDER A CURVE Exit Quiz

ANSWER

Find the area between each curve and the x-axis for the given interval and subinterval using middle sum.

1. $y = 6x^2$ from $x = 1$ to $x = 2, n = 5$



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

$$\Delta x = \frac{2-1}{5}$$

$$\Delta x = \frac{1}{5}$$

$$x_{n-1} = a + (n-1)\cdot\Delta x = 1 + (n-1)\left(\frac{1}{5}\right)$$

$$x_{n-1} = 1 + \frac{n-1}{5} = \frac{5}{5} + \frac{n-1}{5} = \frac{n-1+5}{5}$$

$$x_{n-1} = \frac{n+4}{5}$$

$$x_n = a + n\cdot\Delta x = 1 + n\left(\frac{1}{5}\right) = \frac{5}{5} + \frac{n}{5}$$

$$x_n = \frac{n+5}{5}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{n+4}{5} + \frac{n+5}{5}}{2} = \frac{\frac{n+4+n+5}{5}}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{2n+9}{5}}{2} = \frac{2n+9}{5}\cdot\frac{1}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{2n+9}{10}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = f\left(\frac{2n+9}{10}\right) = 6\left(\frac{2n+7}{8}\right)^2$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = 6\left(\frac{2n+7}{8}\right)^2$$

$$A_n(\mathit{middle\ sum}) = \sum_{n=1}^{n}\left(\frac{b-a}{n}\right)\cdot f\left(\frac{x_n + x_{n-1}}{2}\right)$$

$$A_5(\mathit{middle\ sum}) = \sum_{n=1}^{5}\left(\frac{1}{5}\right)\cdot 6\left(\frac{2n+7}{8}\right)^2$$

$$A_5(\mathit{middle\ sum}) = \frac{6}{5}\sum_{n=1}^{5}\left(\frac{2n+7}{8}\right)^2$$

$$A_5(\mathit{middle\ sum}) = \frac{6}{5}\left(\frac{885}{64}\right)$$

$$A_5(\mathit{middle\ sum}) = \frac{531}{32} = 16.59375$$

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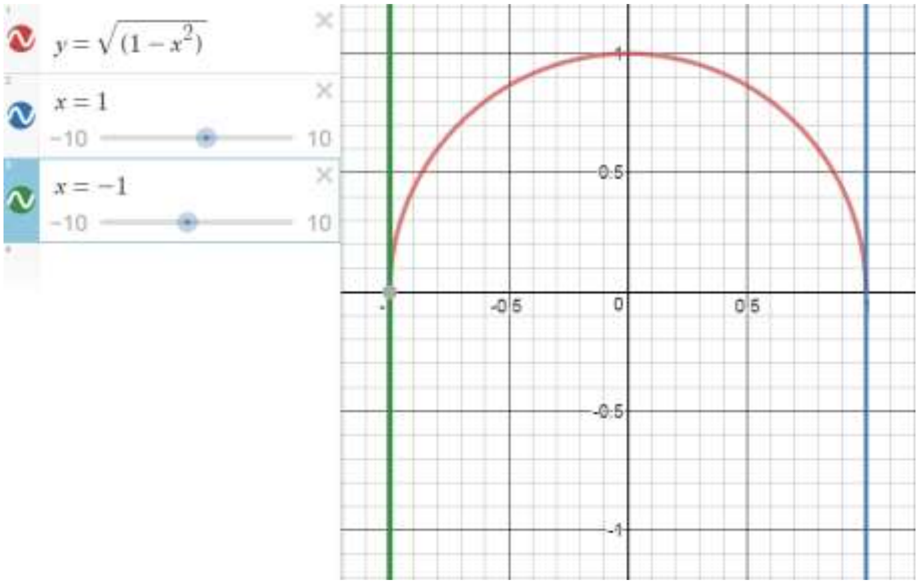
AREA UNDER A CURVE Exit Quiz

2. $y = \sqrt{1 - x^2}$ from $x = -1$ to $x = 1, n = 4$



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

$$\Delta x = \frac{1-(-1)}{4}$$

$$\Delta x = \frac{2}{4}$$

$$\Delta x = \frac{1}{2}$$

$$x_{n-1} = a + (n-1)\cdot\Delta x = -1 + (n-1)\left(\frac{1}{2}\right)$$

$$x_{n-1} = -1 + \frac{n-1}{2} = -\frac{2}{2} + \frac{n-1}{2} = \frac{n-1-2}{2}$$

$$x_{n-1} = \frac{n-3}{2}$$

$$x_n = a + n\cdot\Delta x = -1 + n\left(\frac{1}{2}\right) = -\frac{2}{2} + \frac{n}{2}$$

$$x_n = \frac{n-2}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{n-3}{2} + \frac{n-2}{2}}{2} = \frac{\frac{n-3+n-2}{2}}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{2n-5}{2}}{2} = \frac{2n-5}{2}\cdot\frac{1}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{2n-5}{4}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = f\left(\frac{2n-5}{4}\right) = \sqrt{1 - \left(\frac{2n-5}{4}\right)^2}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \sqrt{1 - \left(\frac{2n-5}{4}\right)^2}$$

$$A_n(middle\ sum) = \sum_{n=1}^{n}\left(\frac{b-a}{n}\right)\cdot f\left(\frac{x_n + x_{n-1}}{2}\right)$$

$$A_4(middle\ sum) = \sum_{n=1}^{4}\left(\frac{1}{2}\right)\cdot\sqrt{1 - \left(\frac{2n-5}{4}\right)^2}$$

$$A_4(middle\ sum) = \frac{1}{2}\sum_{n=1}^{4}\sqrt{1 - \left(\frac{2n-5}{4}\right)^2}$$

$$A_4(middle\ sum) = \frac{1}{2}\left(\frac{1}{2}\left(\sqrt{7} + \sqrt{15}\right)\right)$$

$$A_4(middle\ sum) = \frac{1}{4}\left(\sqrt{7} + \sqrt{15}\right)$$

$$A_4(middle\ sum) = 1.6297$$

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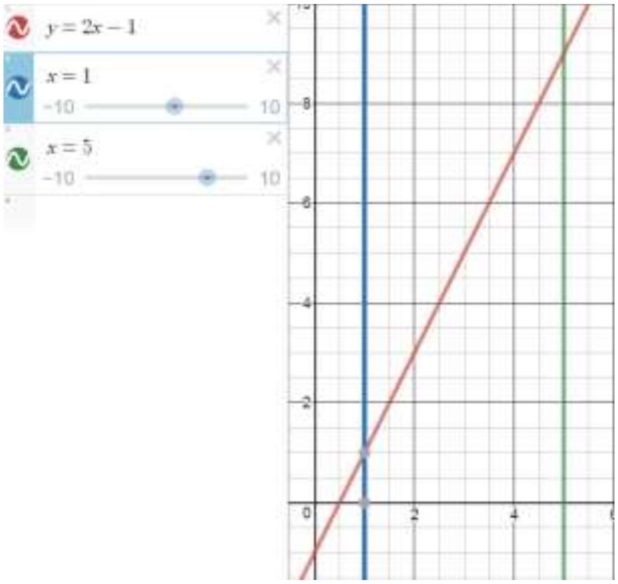
AREA UNDER A CURVE Exit Quiz

3. $y = 2x - 1$ from $x = 1$ to $x = 5, n = 10$



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

$$\Delta x = \frac{5-1}{10}$$

$$\Delta x = \frac{4}{10}$$

$$\Delta x = \frac{2}{5}$$

$$x_{n-1} = a + (n-1)\cdot \Delta x = 1 + (n-1)\left(\frac{2}{5}\right)$$

$$x_{n-1} = 1 + \frac{2n-2}{5} = \frac{5}{5} + \frac{2n-2}{5} = \frac{2n-2+5}{5}$$

$$x_{n-1} = \frac{2n+3}{5}$$

$$x_n = a + n\cdot \Delta x = 1 + n\left(\frac{2}{5}\right) = \frac{5}{5} + \frac{2n}{5}$$

$$x_n = \frac{n+4}{4}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{2n+3}{5} + \frac{2n+5}{5}}{2} = \frac{\frac{2n+3+2n+5}{5}}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{4n+8}{5}}{2} = \frac{4n+8}{5}\cdot\frac{1}{2} = \frac{4n+8}{10}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{2n+4}{5}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = f\left(\frac{2n+4}{5}\right) = 2\left(\frac{2n+4}{5}\right) - 1$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \left(\frac{4n+8}{5}\right) - \frac{5}{5} = \frac{4n+8-5}{5}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \frac{4n+3}{5}$$

$$A_n(\mathit{middle\ sum}) = \sum_{n=1}^{n}\left(\frac{b-a}{n}\right)\cdot f\left(\frac{x_n + x_{n-1}}{2}\right)$$

$$A_{10}(\mathit{middle\ sum}) = \sum_{n=1}^{10}\left(\frac{2}{5}\right)\cdot\left(\frac{4n+3}{5}\right)$$

$$A_{10}(\mathit{middle\ sum}) = \frac{2}{25}\sum_{n=1}^{10}(4n+3)$$

$$A_{10}(\mathit{middle\ sum}) = \frac{2}{25}(250)$$

$$A_{10}(\mathit{middle\ sum}) = 20$$

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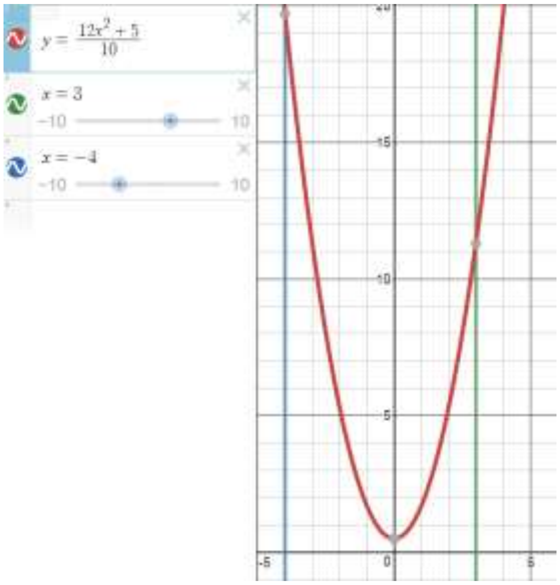
AREA UNDER A CURVE Exit Quiz

4. $y = \frac{12x^2+5}{10}$ from $x = -4$ to $x = 3, \mathbf{n} = 7$



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

$$\Delta x = \frac{3-(-4)}{7}$$

$$\Delta x = \frac{7}{7}$$

$$\Delta x = 1$$

$$x_{n-1} = a + (n-1)\cdot\Delta x = -4 + (n-1)(1)$$

$$x_{n-1} = -4 + n - 1 = x_{n-1} = n - 5$$

$$x_n = a + n\cdot\Delta x = -4 + n(1) = x_n = n - 4$$

$$\frac{x_n + x_{n-1}}{2} = \frac{n-5+n-4}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{2n-9}{2}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = f\left(\frac{2n-9}{2}\right) = \frac{12\left(\frac{2n-9}{2}\right)^2 + 5}{10}$$

$$=$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \frac{12\left(\frac{2n-9}{2}\right)^2 + 5}{10}$$

$$A_n(middle\ sum) = \sum_{n=1}^{n}\left(\frac{b-a}{n}\right)\cdot f\left(\frac{x_n + x_{n-1}}{2}\right)$$

$$A_7(middle\ sum) = \sum_{n=1}^{7}(1)\cdot\frac{12\left(\frac{2n-9}{2}\right)^2 + 5}{10}$$

$$A_7(middle\ sum) = \sum_{n=1}^{7}\left(\frac{12\left(\frac{2n-9}{2}\right)^2 + 5}{10}\right)$$

$$A_7(middle\ sum) = \frac{196}{5} = 39.2$$

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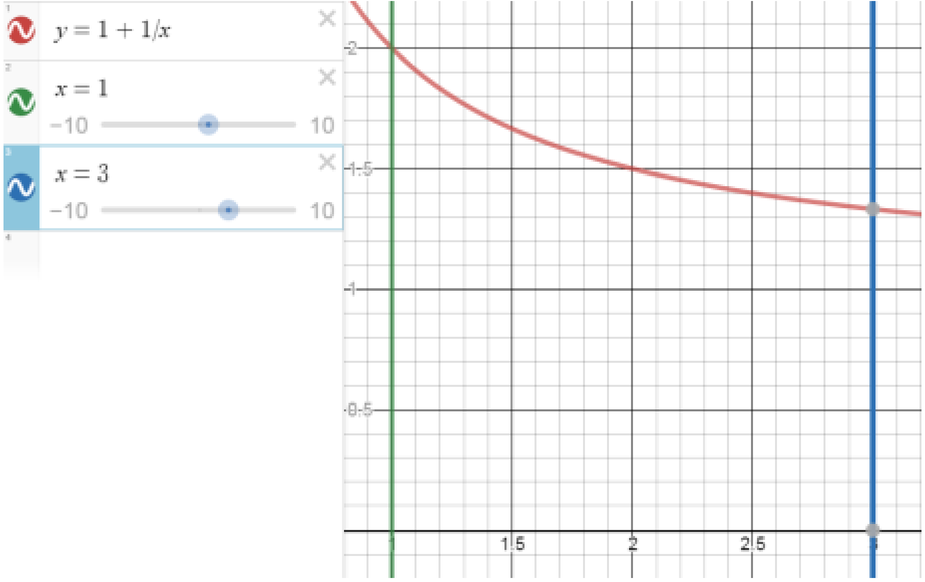
AREA UNDER A CURVE Exit Quiz

5. $y = 1 + \frac{1}{x} = \frac{x}{x} + \frac{1}{x} = \frac{x+1}{x}$ from $x = 1$ to $x = 3, n = 8$



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

$$\Delta x = \frac{3-1}{8}$$

$$\Delta x = \frac{2}{8}$$

$$\Delta x = \frac{1}{4}$$

$$x_{n-1} = a + (n-1) \cdot \Delta x = 1 + (n-1)\left(\frac{1}{4}\right)$$

$$x_{n-1} = 1 + \frac{n-1}{2} = \frac{4}{4} + \frac{n-1}{4} = \frac{n-1+4}{4}$$

$$x_{n-1} = \frac{n+3}{4}$$

$$x_n = a + n \cdot \Delta x = 1 + n\left(\frac{1}{4}\right) = \frac{4}{4} + \frac{n}{4}$$

$$x_n = \frac{n+4}{4}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{n+3}{4} + \frac{n+4}{4}}{2} = \frac{\frac{n+3+n+4}{4}}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{\frac{2n+7}{4}}{2} = \frac{2n+7}{4} \cdot \frac{1}{2}$$

$$\frac{x_n + x_{n-1}}{2} = \frac{2n+7}{8}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = f\left(\frac{2n+7}{8}\right) = \frac{\frac{2n+7}{8} + 1}{\frac{2n+7}{8}}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \frac{\frac{2n+7}{8} + \frac{8}{8}}{\frac{2n+7}{8}} = \frac{\frac{2n+15}{8}}{\frac{2n+7}{8}}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \frac{2n+15}{8} \cdot \frac{8}{2n+7}$$

$$f\left(\frac{x_n + x_{n-1}}{2}\right) = \frac{2n+15}{2n+7}$$

$$A_n(middle\ sum) = \sum_{n=1}^{n} \left(\frac{b-a}{n}\right) \cdot f\left(\frac{x_n + x_{n-1}}{2}\right)$$

$$A_8(middle\ sum) = \sum_{n=1}^{8} \left(\frac{1}{4}\right) \cdot \left(\frac{2n+15}{2n+7}\right)$$

$$A_8(middle\ sum) = \frac{1}{4} \sum_{n=1}^{8} \frac{2n+15}{2n+7}$$

$$A_8(middle\ sum) = \frac{1}{4}(12.3853)$$

$$A_8(middle\ sum) = 3.0963$$