MCV4U - Calculus & Vectors

Unit 1 - Tangents & Limits

Rationalizing Expressions

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Two fundamental problems led to development of what is now called calculus.

1. What is the slope of a tangent line to a curve?

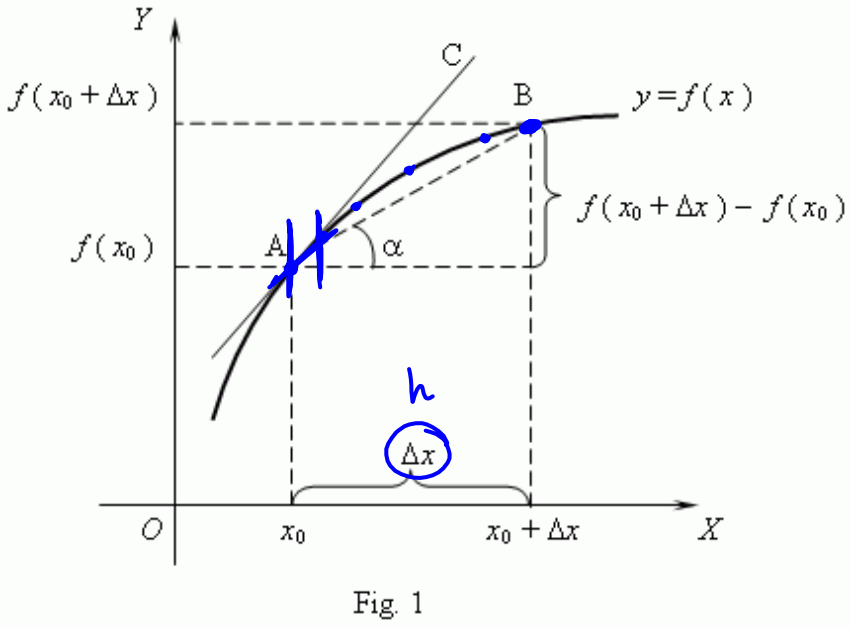

Fig. 1

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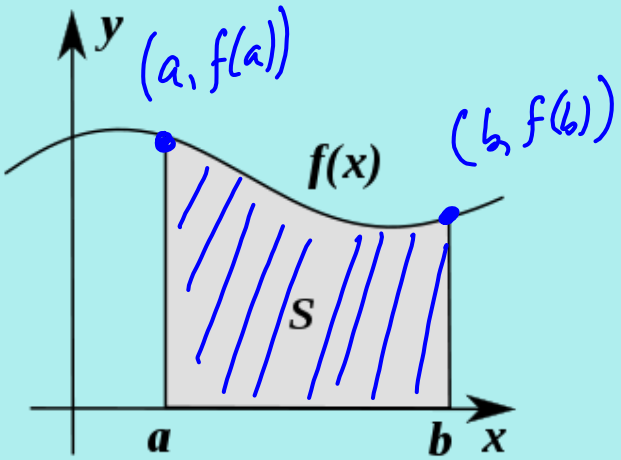
Two fundamental problems led to development of what is now called calculus.

2. What is the area under the graph of a function between x = a and x = b?



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Unit 1 - Tangents & Limits

Lesson 1: Rationalizing Expressions

Recall:

$$\frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{a}}{\sqrt{b}} \times 1 = \frac{\sqrt{a}}{\sqrt{b}} \times \frac{\sqrt{b}}{\sqrt{b}} = \frac{\sqrt{ab}}{b}$$

$b \neq 0$

$$\frac{1}{\sqrt{a}-\sqrt{b}} = \frac{1}{\sqrt{a}-\sqrt{b}} \times \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}+\sqrt{b}} = \frac{\sqrt{a}+\sqrt{b}}{a-b}$$

where $\sqrt{a}+\sqrt{b}$ is the conjugate of $\sqrt{a}-\sqrt{b}$

$(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})$

$= (\sqrt{a})^2 - (\sqrt{b})^2$

$= a - b$

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Ex.1 Rationalize the denominator.

a) $\frac{4}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{2\cancel{4}\sqrt{3}}{1\cancel{2}(\sqrt{3})^2}$

$= \frac{2\sqrt{3}}{3}$ ✓

b) $\frac{4}{\sqrt{3}+\sqrt{5}} \times \frac{\sqrt{3}-\sqrt{5}}{\sqrt{3}-\sqrt{5}}$

$= \frac{4(\sqrt{3}-\sqrt{5})}{3-5}$

$= \frac{4(\sqrt{3}-\sqrt{5})}{-2}$

$= -2(\sqrt{3}-\sqrt{5})$ ✓

$= -2\sqrt{3}+2\sqrt{5}$ ✓

$= 2\sqrt{5}-2\sqrt{3}$ ✓

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Ex.2 Rationalize the numerator.

a) $\frac{\sqrt{72}-\sqrt{8}}{10} \times \frac{\sqrt{72}+\sqrt{8}}{\sqrt{72}+\sqrt{8}}$ ($6\sqrt{2} - 2\sqrt{2}$)

$= \frac{72-8}{10(\sqrt{72}+\sqrt{8})}$

$= \frac{\cancel{64}32}{\cancel{10}5(\sqrt{72}+\sqrt{8})}$

$= \frac{32}{5(\sqrt{72}+\sqrt{8})}$

$= \frac{32}{5(\sqrt{36\cdot 2}+\sqrt{4\cdot 2})}$

$= \frac{32}{5(6\sqrt{2}+2\sqrt{2})}$

$= \frac{\cancel{32}4}{5(\cancel{8}\sqrt{2})}$

$= \frac{4}{5\sqrt{2}}$ ✓

b) $\frac{\sqrt{x-6}+5}{x} \times \frac{\sqrt{x-6}-5}{\sqrt{x-6}-5}$

$= \frac{(x-6)-25}{x(\sqrt{x-6}-5)}$

$= \frac{x-31}{x(\sqrt{x-6}-5)}$ ✓

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Assigned Work:

p.9 # 1, 2 (basics)
p.9 # 3bdf, 4, 6ef, 7

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