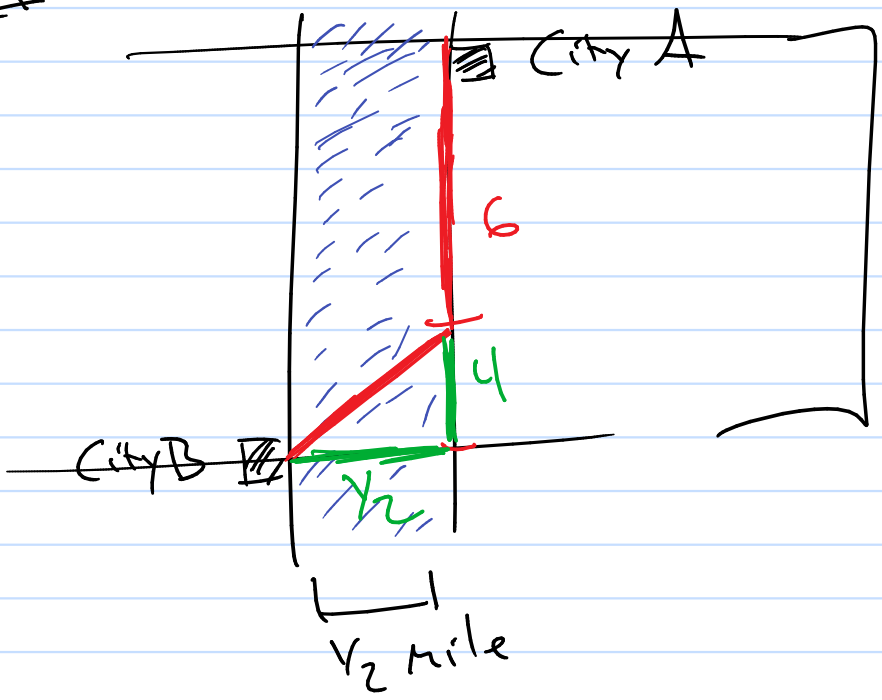
# Math 112

**Q's**

City A , City B




10 Miles

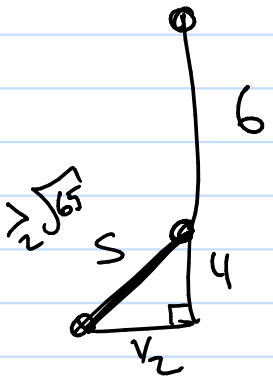
$D = rt$

$\frac{D}{t} = r$

$\frac{D}{r} = t$

$t = \frac{D}{r}$

**Distance**

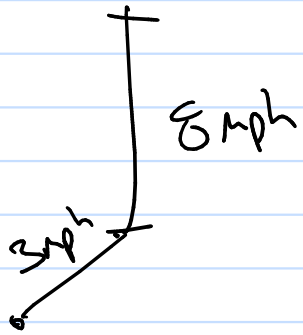



$(\frac{1}{2})^2 + (4)^2 = S^2$

$S = \sqrt{\frac{1}{4} + 16} = \sqrt{\frac{65}{4}} = \frac{\sqrt{65}}{\sqrt{4}} = \frac{\sqrt{65}}{2} = \frac{1}{2}\sqrt{65}$ miles

$\frac{64}{4}$

**rates**




**times**


$t_1 = \frac{6 \text{ miles}}{8 \frac{\text{miles}}{\text{hr}}} = \frac{3}{4}$ hr

$t_2 = \frac{\frac{1}{2}\sqrt{65}}{\frac{3}{1}}$

$= \frac{1}{3}\frac{1}{2}\sqrt{65} = \frac{1}{6}\sqrt{65}$

**total time:** $\left(\frac{3}{4} + \frac{1}{6}\sqrt{65}\right)$ hr ✓

# Functions

Notation: (ex) $f(t) = \dfrac{t^3 + 3t^2}{t - 1}$

$\sqrt[3]{x^7}$

(ex) $f(x) = \sqrt{x^7} - x^3 + x^{7/3}$

(ex) $f(s) = s^3 + s^2 + s + 1$

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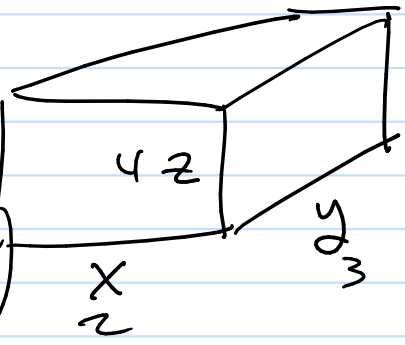
Note: above are functions of one variable.

In calc 3 functions of several variables.

$$V(x, y, z) = x \cdot y \cdot z$$




$V(2, 3, 4) = 2 \cdot 3 \cdot 4 = 24 \text{ units}^3$

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(ex) $f(s) = s^2 + \sqrt{s}$

$f(\square) = \square^2 + \sqrt{\square}$

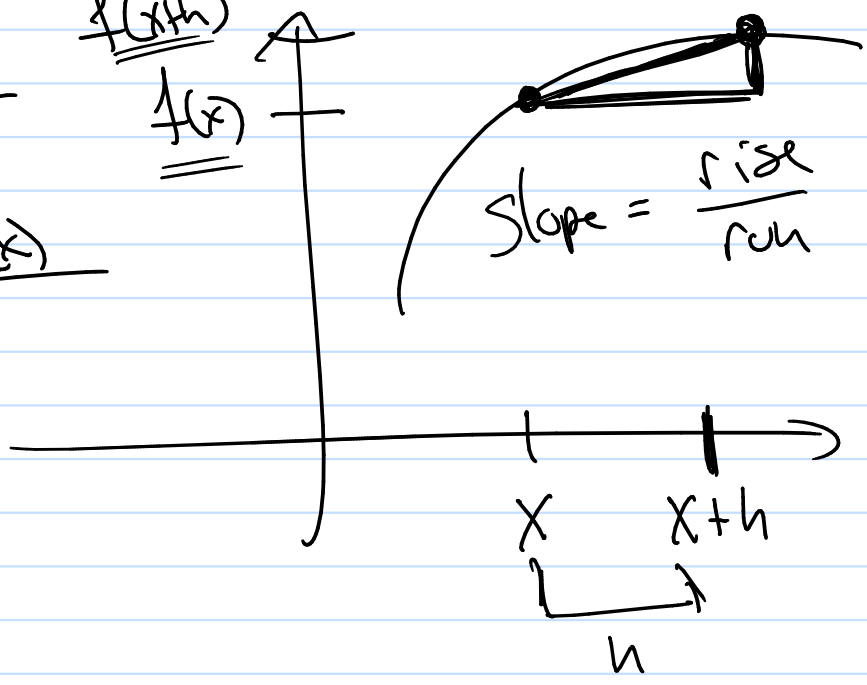
(?) $\dfrac{f(x+h) - f(x)}{h} = \dfrac{\left((x+h)^2 + \sqrt{x+h}\right) - \left(x^2 + \sqrt{x}\right)}{h}$

$f(x+h) = (x+h)^2 + \sqrt{x+h}$

$f(x) = x^2 + \sqrt{x}$

Difference Quotient

$= \dfrac{f(x+h) - f(x)}{h}$



(ex) $f(x) = 2x + 3$ $\quad f(x+h) = 2(x+h) + 3$

$f(\square) = 2\square + 3$ $\quad f(x) = 2x + 3$

Diff. Quotient: $\dfrac{f(x+h) - f(x)}{h} = \dfrac{(2x+2h+3) - (2x+3)}{h}$

$= \dfrac{2h}{h} = 2$

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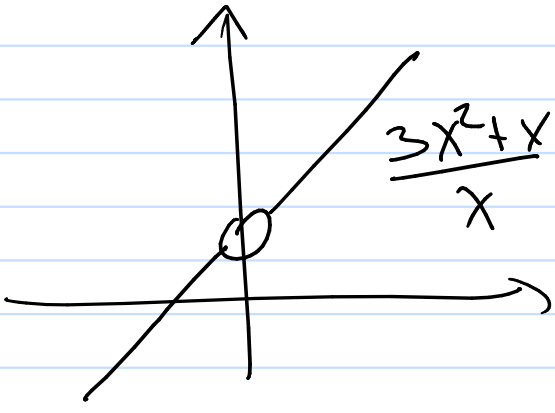
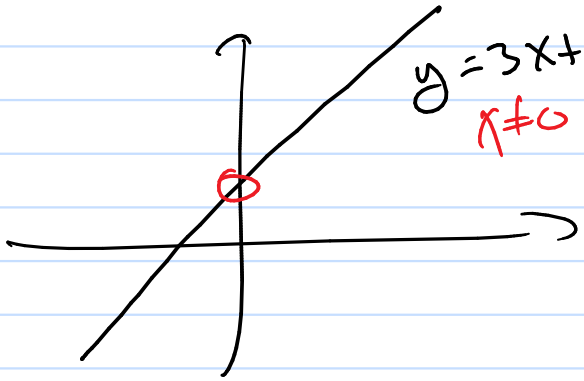
Note: $\dfrac{3x^2 + x}{x}$ $\quad$ Fact: $\dfrac{a \cdot c}{a} = c$

$\dfrac{(x)(3x+1)}{(x)\cdot 1} = \boxed{3x+1}, \; x \neq 0$



Given two functions of same domain and codomain $\mathbb{R}$ $\mathbb{R}$

$f(x)$, $g(x)$ are the functions

Combine into one function

① $(f+g)(x) = f(x) + g(x)$

② $(f-g)(x) = f(x) - g(x)$

③ $(fg)(x) = f(x) \cdot g(x)$

Domain of new function is Domain of $f$ and $g$

④ $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$

Domain of $f$ ∩ Domain of $g$ and $g(x) \neq 0$

⑤ Composition