Pre-Cal 9/8

Ex

$$\frac{x^3+x^3}{(x^2+4)^2} = \frac{Ax+B}{x^2+4} + \frac{Cx+D}{(x^2+4)^2}$$

$$x^3+x^2 = (Ax+B)(x^2+4) + (Cx+D)$$

x^3: $A = 1$

x^2: $B = 1$

x^1: $4A + C = 0 \Rightarrow C = -4A = -4$

x^0: $4B + D = 0 \Rightarrow D = -4B = -4$

$$\frac{x^3+x^3}{(x^2+4)^2} = \frac{x+1}{x^2+4} + \frac{-4x-4}{(x^2+4)^2}$$

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$$\frac{y}{y^2-2y-3} = \frac{A}{y+1} + \frac{B}{y-3}$$

$$y = A(y-3) + B(y+1)$$

y^1: $A + B = 1 \rightarrow B = 1 - \frac{1}{4} = \frac{3}{4}$

y^0: $-3A + B = 0$

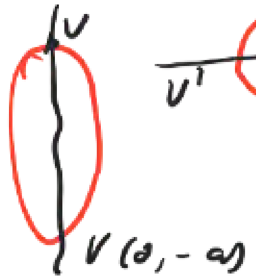
$4A = 1$

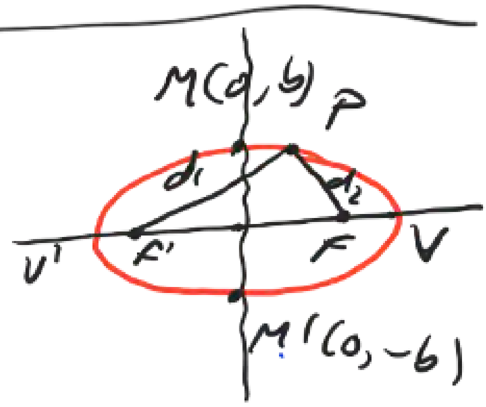
$A = 1/4$

$$\frac{y}{y^2-2y-3} = \frac{1/4}{y+1} + \frac{3/4}{y-3}$$

$y+1 \quad - \quad 4 \quad y-3$

5.3 Ellipse





$P(x, y)$

$F(c, 0) \quad F'(-c, 0)$

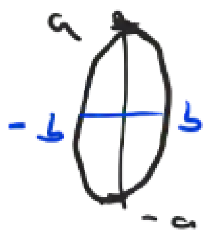
$F(\pm c, 0)$

$V(\pm a, 0)$

$d_1 + d_2 = 2a$

Formula : $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ $\quad a > b$

$\dfrac{x^2}{b^2} + \dfrac{y^2}{\underline{\underline{a}}^2} = 1$



in Ellipse, $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$

if $a = b \Rightarrow$ circle : $x^2 + y^2 = a^2$

Ex $\quad 2x^2 + 9y^2 = 18$

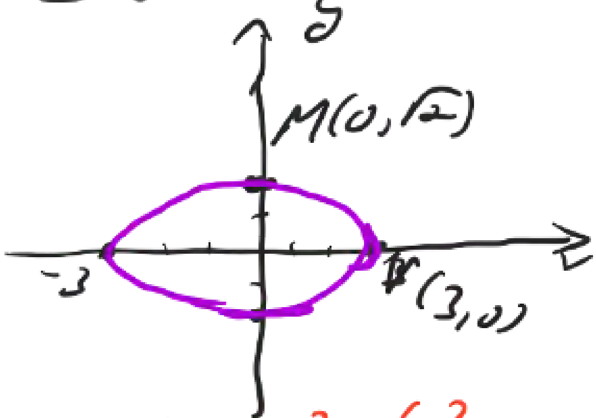
$$\frac{x^2}{9} + \frac{y^2}{2} = 1$$

$a^2 = 9 \Rightarrow a = \pm 3$

$b^2 = 2 \Rightarrow b = \sqrt{2}$

$V(\pm 3, 0)$

$M(0, \pm\sqrt{2})$



$c^2 = a^2 - b^2$

$= 9 - 2$

$F\ (\pm\sqrt{7}, 0) \qquad = 7$

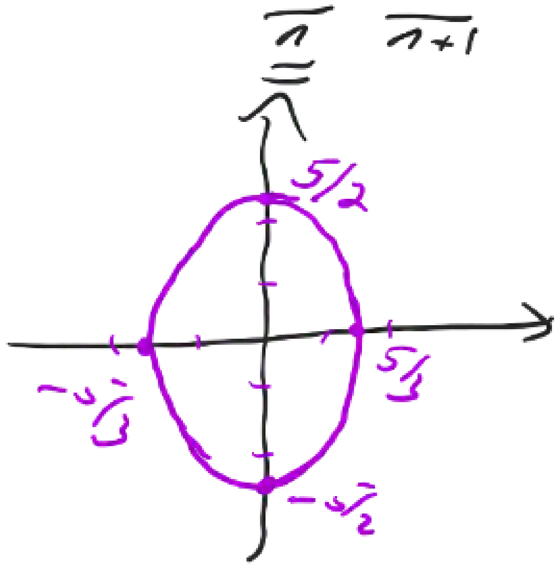
Ex

$$\frac{9x^2}{25} + \frac{4y^2}{25} = \frac{25}{25}$$

$$\frac{x^2}{\frac{25}{9}} + \frac{y^2}{\frac{25}{4}} = 1$$

$$a^2 = \frac{25}{4} \Rightarrow a = \pm\frac{5}{2}$$

$$b = \pm\frac{5}{3}$$



Ex Given

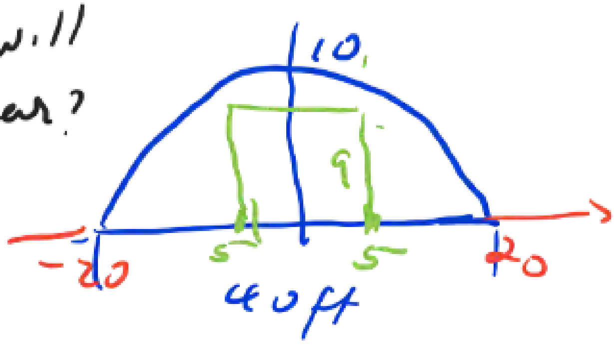
$a = 20$

$b = 10$

$w = 10\,ft$

$x = 5, \quad h = 9$

Find: will clear?



$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\frac{x^2}{20^2} + \frac{y^2}{10^2} = 1 \quad (x = 5)$$

$$\frac{y^2}{10^2} = 1 - \frac{5^2}{20^2}$$

$$= \frac{400 - 25}{20^2}$$

$$y^2 = \frac{10^2}{20^2}(375)$$

$$(10)^2 \,(375)$$

$y \;:\; \left(\frac{\quad}{20}\right)$

$$\left(\frac{1}{2}\right)^2 (375)$$

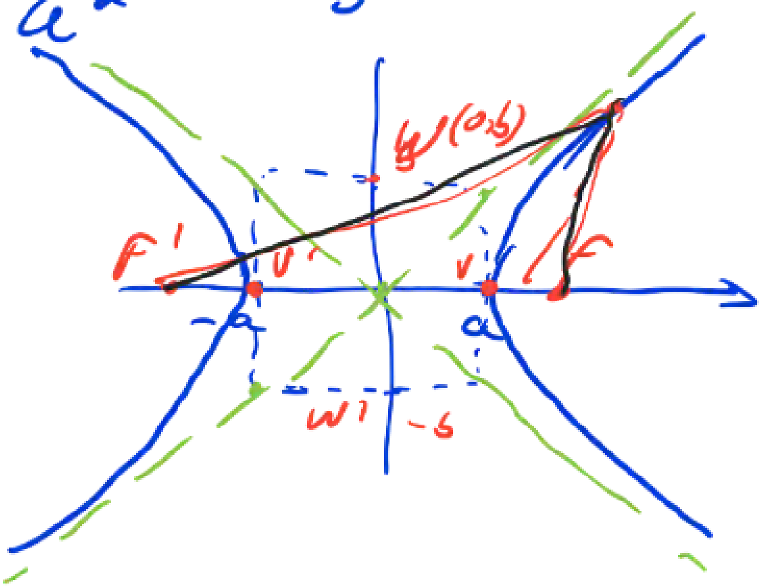
$$\frac{1}{4}(375)$$

$$81 < 93\ldots$$ compare

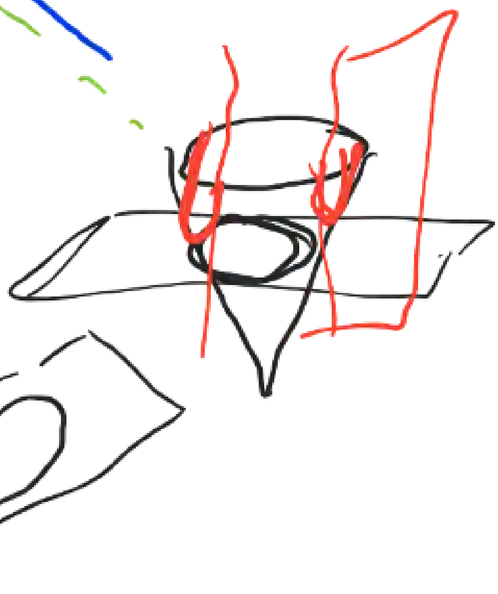
$\therefore$ The truck will clear.

5.4 Hyperbolas

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$



$$\boxed{d_1 - d_2 = 2a}$$



Ex $\quad 9x^2 - 4y^2 = 36$

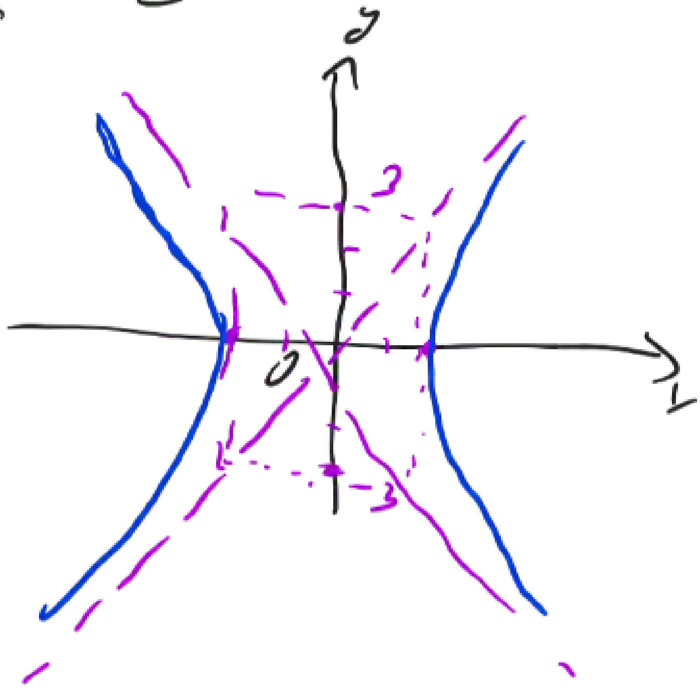
Soln

$$\frac{x^2}{4} - \frac{y^2}{9} = 1$$

$a^2 = 4$

$b^2 = 9 \to b = \pm 3$

$c^2 = a^2 + b^2 = 13$



Asymptotes

$$\frac{x^2}{4} - \frac{y^2}{9} = 0$$

$$\frac{y^2}{9} = \frac{x^2}{4}$$

$$y^2 = \frac{9}{4}x^2$$

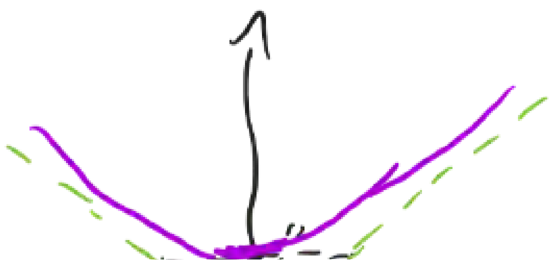
$$\boxed{y = \pm\frac{3}{2}x}$$

Ex $4y^2 - 2x^2 = 1$

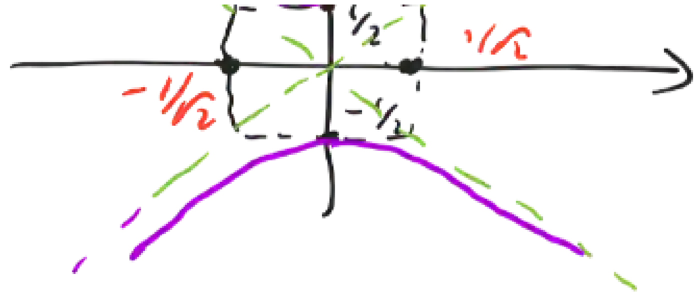
$$\frac{y^2}{\underbrace{\frac{1}{4}}_{a^2}} - \frac{x^2}{\underbrace{\frac{1}{2}}_{b^2}} = 1$$

$a = \pm\frac{1}{2}$

$b = \pm\frac{1}{\sqrt{2}}$

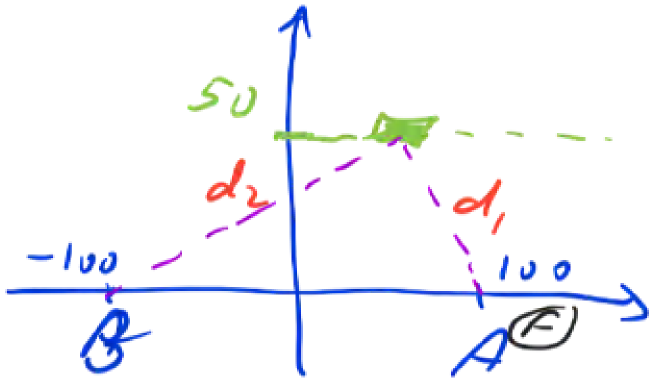


v_2



Ex

$C = 100$



Given: $v = 980 \, ft/\mu sec$

$t = 400 \, \mu sec.$

$\frac{1}{10^3} sec$

$1\mu = 10^{-3} sec$

$1 sec = 10^3 \mu sec$

$d_2 - d_1 = 2a$

$= 980 \frac{ft}{\mu sec} \cdot 400 \, \mu sec$

$= 392 \times 10^3 \, ft \, \frac{1 \, mi}{5280 \, ft}$

$2a = \frac{392}{528} 10^2 \, mi$

$a = \frac{196}{528} 10^2 = \frac{49}{132} 10^2$

$C = 100$

$b^2 = c^2 - a^2$

$= 10^4 - \left(\frac{49}{132}\right)^2 10^4$

$= 10^4 \left(1 - \left(\frac{49}{132}\right)^2\right)$

$= 10^4 \left(\frac{132^2 - 49^2}{132^2}\right)$

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$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

$$\frac{x^2}{\left(\frac{19}{132}\right)^2 10^4} - \frac{y^2}{10^4\left(\frac{132^2-19^2}{132^2}\right)} = 1$$

$$\boxed{y = 50}$$

$$\frac{x^2}{\left(\frac{19}{132}\right)^2 10^4} = 1 + \frac{132^2}{10^4}\,\frac{50^2}{132^2-19^2}$$

$$x^2 = \frac{19^2 10^4}{132^2}\left(\quad\right)$$

$$x = \sqrt{}$$