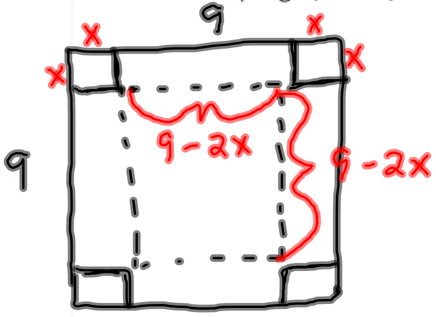
1. Let $f(x)=\dfrac{3x^2-2x}{9x^2-4}$ $= \dfrac{x(3x-2)}{(3x+2)(3x-2)} = \dfrac{x}{3x+2}$

   a. Find the vertical asymptote(s) VA: $x = -\frac{2}{3}$

   b. Find the horizontal asymptote(s) HA: $y = \frac{1}{3}$

2. A square sheet of cardboard that is 9 inches by 9 inches is used to make an open-top box by cutting a square from each of the four corners of the sheet then folding up the sides. What are the dimensions (length, width, and height) of such a box that has maximum volume?



$V = x(9-2x)(9-2x)$
$= x(81-36x+4x^2)$
$= 81x - 36x^2 + 4x^3 \Rightarrow$
$V' = 81 - 72x + 12x^2$ or
$12x^2 - 72x + 81 = 0 \Rightarrow$
$x = 3/2$ or $\cancel{9/2}$
Dim: $6 \times 6 \times 1.5$

3. Find $\dfrac{dy}{dx}$ if $2x^3 - y^4 + 8 = y^2$

$6x^2 - 4y^3 \cdot \dfrac{dy}{dx} = 2y\dfrac{dy}{dx} \Rightarrow$

$6x^2 = 2y\dfrac{dy}{dx} + 4y^3\dfrac{dy}{dx} \Rightarrow$

$6x^2 = 2y\dfrac{dy}{dx}(1+2y^2) \Rightarrow$

$\dfrac{dy}{dx} = \dfrac{6x^2}{2y(1+2y^2)} = \dfrac{3x^2}{y(1+2y^2)}$

4. 13 cubic inches of air is pumped into a spherical balloon each second. At what rate is the radius of the balloon changing when the radius of the balloon is 3 inches? Hint: $V_{sphere} = \frac{4}{3}\pi r^3$

$\dfrac{dV}{dt} = 13$

$\dfrac{dr}{dt} = ?$

$\dfrac{dV}{dt} = 4\pi r^2 \dfrac{dr}{dt}$

$13 = 4\pi(3)^2 \dfrac{dr}{dt} \Rightarrow$

$\dfrac{dr}{dt} = \dfrac{13}{36\pi}$ in/sec $\approx \underline{.115}$