73 $f(v) = \dfrac{v^3}{v - v_r}$ v_r = velocity of river H_2O

minimize f

$$f'(v) = \frac{(v - v_r)3v^2 - v^3(1)}{(v - v_r)^2}$$

$$= 3v^3 - 3v^2 v_r - v^3 = \frac{2v^3 - 3v^2 v_r}{(v - v_r)^2}$$

$$0 = \frac{2v^3 - 3v^2 v_r}{(v - v_r)^2} \qquad \frac{v^2(2v - 3v_r)}{(v - v_r)^2} = 0$$

$v = 0$ $\quad 2v - 3v_r = 0$ $\quad v = \dfrac{3v_r}{2}$

$v_r = 10$

47 $y = \sqrt{2}\,\theta - \sec\theta \quad [0, \pi/3]$

$y(0) = -\sec\theta = -1$ MIN

$y(\pi/3) = \sqrt{2}\cdot\pi/3 - 2$

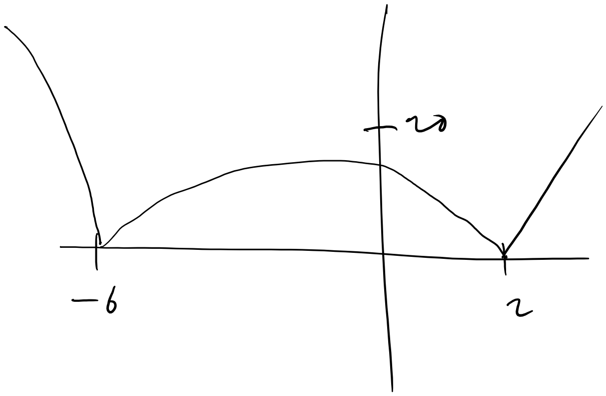
$$\frac{dy}{d\theta} = \sqrt{2} - \sec\theta\tan\theta = 0$$

$$\sec\theta\tan\theta = \sqrt{2}$$

$$\theta = \pi/4$$

$y(\pi/4) = \sqrt{2}\cdot\frac{\pi}{4} - \sqrt{2}$ MAX

61 $y = |x^2 + 4x - 12|$ $[0, 3]$



critical points?

$x = 2$ (y' DNE)

$y = |4 + 8 - 12| = 0$ MIN

$y(0) = 12$ MAX

$y(3) = |9 + 12 - 12| = 9$