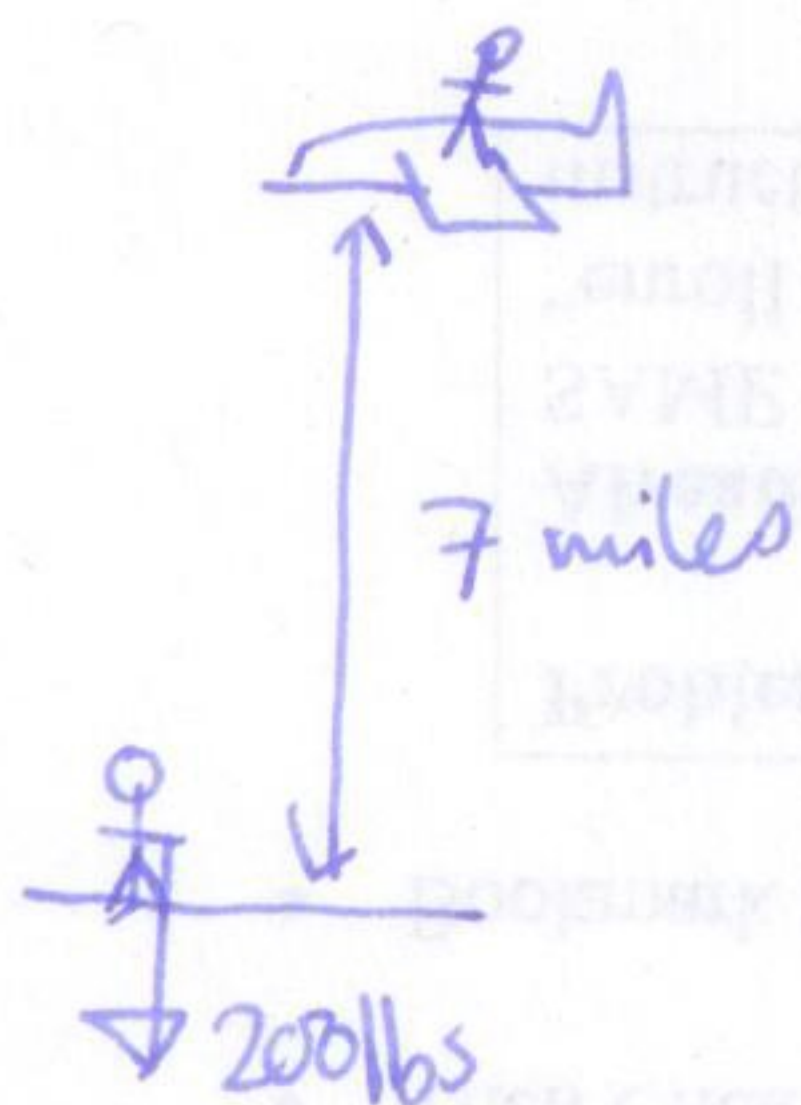


Example weight loss

$$w(x) = \frac{wR^2}{x^2}$$

$R = 3960$ miles
(radius of earth)

(61)



$$w'(x) = -\frac{2wR^2}{x^3}$$

$x =$ distance from center of the earth.

$w =$ weight at $R=3960$
(ground level)

$$w(3960+7) \approx w(3960) + w'(3960)\Delta x$$

$$\approx 200 + \frac{-2 \cdot 200 \cdot 3960^2}{3960^3} \cdot 7 \approx 0.7 \text{ lbs.}$$

Example pizza slice size: 18" pizza, diameter accurate to ± 0.4 in, what is accuracy of area?

$$A = \pi r^2 \quad 2r = D \quad A = \pi \left(\frac{D}{2}\right)^2 = \frac{1}{4} \pi D^2$$

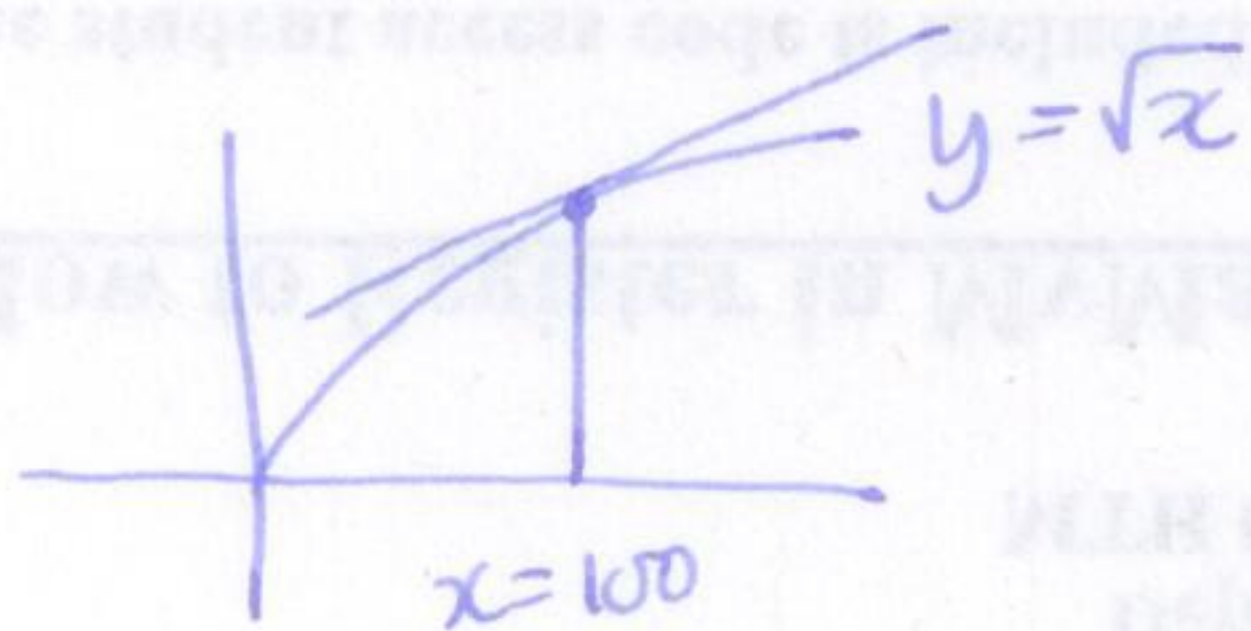
$$A'(D) = \frac{1}{2} \pi D$$

$$\Delta A \approx A'(18)\Delta D = \frac{1}{2} \pi \cdot 18 \cdot 0.4 \approx 11 \text{ in}^2$$

Q: is this good or bad? compare with actual area $\frac{1}{4} \cdot 18^2 \approx \dots$

Linear approximations we can approximate $f(x)$ by its tangent line.

Example



tangent line at $x=100$

$$\text{slope: } f'(100) = \frac{1}{20}$$

point (100, 10)

$$y - 10 = \frac{1}{20}(x - 100)$$

$$y = \frac{1}{20}x + 5$$