L'(t) = \frac{k(L_{oo}-L_0)e^{-kt}}{\lambda_0} > 0 \ \forall \ t

So L is incr \ \forall \ t.

Def. A fcn f on a dom D is concave up if f' is incr on D, & concave down if f' is decr on D.

Picture of conc up:

slopes of tan lines getting bigger

Der incr. decr.

Note: Monotonicity & concavity of f are unrelated.

Ex. Suppose f is twice diff on open interval I.

a) If f''(x) > 0 \ \forall \ x \in \ I, then f is conc up on I.

b) If f''(x) < 0 \ \forall \ x \in \ I, then f is conc down on I.

Find intervals where f(x) = \frac{x-\frac{1}{x^2}}{\sqrt[3]{2}}

incr or decr & alter its concavity.

Solu.: Need f' & f''.

f'(x) = \frac{(x+2)1 - (x-2)1}{(x^2)^2} = \frac{4}{(x^2)^2} \ \ \ \text{on } x \in (-\sqrt[3]{2}, \sqrt[3]{2})

f''(x) > 0 \ \text{on } D = (-\sqrt[3]{2}, -2) \cup (2, \sqrt[3]{2})

f''(x) = -2 \cdot \frac{x^3}{(x^2)^2} = -\frac{16}{(x^2)^2} \ \ \text{on } x \in (-\sqrt[3]{2}, -2)

f''(x) < 0 \ \text{if } x > 2

So f conc up on (-\sqrt[3]{2}, -2)

conc down on (\sqrt[3]{2}, 2)

5.3 Extrema & inflection pts.

Recall candidates for loc extrema:

\frac{d}{dt} L(t) = L_{oo} - (L_{oo}-L_0)e^{-kt}

k > 0 \ & \ L_{oo} > L_0 > 0

(models fish length as fun of time — see text)