Marginal Cost & Revenue

(A) Cost

- Cost $C(q)$ increases concavely with quantity $q$.
- Concave up (oblivion increase)
- Concave down (oblivion increase)
- Fixed costs increase

In practice cost functions are not linear, instead

* They increase quickly at first, then slow down because producing more goods is more efficient (economies of scale)

** At larger production quantities, costs increase faster e.g. 1. New equipment 2. New factory.

(B) Revenue

Increasing production causes a glut in the market forcing prices down
We still want \( R(q) > C(q) \) so the manufacturer must produce at some point \( q_0 < q < q_1 \), but what point exactly?

Marginal analysis (Initially Delta offers 100 flights per day)

Suppose Delta wants to decide whether to offer additional flights. How do they decide?

Zoom around \( q = 100 \)

We analyze \( MC(100) \) and compare to \( NMR(100) \).
\[ MC(q) = C'(q) \] - the instantaneous rate of change w.r.t q (slope of cost function)

\[ MR(q) = R'(q) \] - slope of revenue function.

Since \( q = 100 \), \( MC < MR \), the airline should add one more flight.

**In general**

1. Marginal cost (MC) = \( C'(q) \) so \( \text{Marginal Cost} \equiv C(q+1) - C(q) \)

2. Marginal revenue (MR) = \( R'(q) \) so \( \text{Marginal Revenue} \equiv R(q+1) - R(q) \)

**Graphs**

Suppose

\[ \text{(a)} \]

\[ \text{(b)} \]

the marginal graphs

\[ \$/\text{item} \]

Marginal Revenue

\[ \$ / \text{item} \]

Marginal Cost
Decision making and derivatives

The company's revenue from car sales is $R = f(q)$ where $R$ is a function of advertising expenditure, $q$, in thousands of dollars.

(a) What does the company hope to be true about the sign of $f'$?

(b) Suppose the company plans to spend $100,000 on advertising. If $f'(100) = 2$, should the company spend more or less?

What if $f'(100) = 0.5$?

(a) $f'(q) > 0$ — increased advertising brings in more customers $\Rightarrow$ more revenue.

(b) $f'(100) = 2$ means if the advertising budget is $100,000, an extra dollar spent on advertising will bring in $2 in sales.

$f'(100) = 0.5$ $\Rightarrow$ an extra dollar spent on advertising above $100,000 brings in 50c.

* If $f'(q) > 1$ spend more otherwise too much is being spent!