

calculus-based poster. use differentiation and integration.

CALCULUS-BASED KITCHEN CLEANLINESS POSTER

"What Is Not Cleaned Accumulates"

1. THE DIRT ACCUMULATION EQUATION

$$\frac{dD}{dt} = A - C$$

Where:

- **D** = Dirt level in kitchen
- **t** = Time
- **A** = Rate dirt is added (cooking, spills, grease, dust)
- **C** = Rate dirt is removed (cleaning)

Interpretation

- If $A > C$, kitchen becomes dirtier.
- If $A = C$, kitchen stays at the same cleanliness level.
- If $A < C$, kitchen becomes cleaner.

2. HOW A KITCHEN BECOMES DIRTY

Sources of accumulation:

Source	Dirt Added
Cooking grease	High
Food crumbs	Medium
Dirty dishes	High

Source	Dirt Added
Garbage	High
Dust	Low
Spills	Medium
Refrigerator drips	Medium

As time passes:

$$D(t) = \int A dt$$

The integral means:

Every crumb, spill, and grease particle adds to the total dirt burden.

Small amounts accumulate into a large problem.

3. THE CLEANING REMEDY

Cleaning acts as a negative rate.

Examples:

Activity	Dirt Removed
Wipe counter	Moderate
Wash dishes	High
Sweep floor	Moderate
Mop floor	High
Empty trash	Moderate
Clean stove	High

Total dirt remaining:

$$D(t) = D_0 + \int (A - C) dt$$

Meaning:

Cleaning subtracts accumulated dirt from the kitchen system.

4. CRITICAL THRESHOLD

Let:

- 0–20 = Clean
- 20–40 = Acceptable
- 40–60 = Dirty
- Above 60 = Unsanitary

When:

$$\frac{dD}{dt} > 0$$

for many consecutive days,

the kitchen crosses the sanitation threshold.

5. HOW OFTEN SHOULD CLEANING OCCUR?

Suppose dirt accumulates at:

$$A = 5 \text{ units/day}$$

Maximum acceptable dirt:

$$D_{max} = 20$$

Then:

$$5t = 20$$

$$t = 4 \text{ days}$$

Therefore:

Clean before Day 4.

Daily light cleaning is preferred.

6. DAILY CLEANING SCHEDULE

After Every Meal

- Wash dishes
- Wipe counters
- Put food away

Result:

$$C \approx A$$

Kitchen remains stable.

Daily

- Sweep floor
- Empty garbage
- Clean sink

Result:

$$C > A$$

Kitchen improves.

Weekly

- Mop floor
- Clean refrigerator shelves
- Degrease stove
- Clean microwave

Removes accumulated dirt integral from the week.

7. THE AREA UNDER THE DIRT CURVE

The total sanitation burden is:

$$\int D(t) dt$$

A dirty kitchen for many days creates a large area under the curve.

Example:

- Dirt level 10 for 1 day = 10 dirt-days
- Dirt level 50 for 7 days = 350 dirt-days

Large accumulated burden leads to:

- Odors
 - Mold
 - Pests
 - Food contamination
 - Increased cleaning effort
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8. LAW OF KITCHEN MAINTENANCE

"The longer dirt remains, the larger the integral of dirt accumulation and the greater the cleaning effort required."

Goal

Keep:

$$\frac{dD}{dt} \leq 0$$

through regular cleaning.

Clean a little every day rather than a lot once a month.

KITCHEN CLEANLINESS FORMULA

$$\text{Clean Kitchen} = \int (\text{Cleaning Rate} - \text{Dirt Rate}) dt > 0$$

Inspection Rule:

If you cook today, clean today.

If you spill today, wipe today.

If garbage is full today, empty today.

Do not allow dirt to accumulate faster than it is removed.

