

- 6.7 The Natural Exponential Function -

**Objective:**

Students will learn and apply the natural exponential function.

**EQ:** what is the natural exponential function?

**Derivative:** If  $f(x) = e^u$  then  $f'(x) = u' \cdot e^u$

**Integral:**  $\int e^u du = e^u + C$

How would I take the derivative of  $e^x$ ?

$$\ln f(x) = \ln e^x$$

$$\ln f(x) = x \ln e \rightarrow \ln f(x) = x$$

$$f(x) \cdot \frac{1}{f(x)} \cdot f'(x) = 1 \cdot f(x)$$

$$f'(x) = f(x)$$

$$f'(x) = e^x$$

**Example 1:**

If  $f(x) = 7e^{5x}$  then find  $f'(x)$

$$f'(x) = 7e^{5x} \cdot 5$$

**Final Answer** →

$$f'(x) = 35e^{5x}$$

**Example 2:**

Differentiate  $y = \cos(\ln e^{7x})$

$$y = \cos(\ln e^{7x})$$

$$y = \cos(7x)$$

$$y' = -\sin(7x) \cdot 7$$

$$y' = -7\sin(7x)$$

$$y' = -\sin(\ln e^{7x}) \cdot \frac{1}{e^{7x}} \cdot 7e^{7x}$$

$$y' = -7\sin(\ln e^{7x})$$

$$y' = -7\sin(7x)$$

\*most simplified

What is the most simplified answer?

**Example 3:**

Simplify  $\int e^{0.2x} dx$

$$\int e^{0.2x} dx = \frac{1}{0.2} e^{0.2x} + C$$

How would I use u substitution to solve?

$$u = 0.2x$$

$$du = 0.2 dx$$

$$\frac{1}{0.2} \int e^u \cdot 0.2 dx$$

$$\frac{1}{0.2} \int e^u du = \frac{1}{0.2} e^u + C$$

$$\frac{1}{0.2} e^{0.2} + C$$

**Summary:** what is the natural exponential function?

When  $e^x$  is in a problem, you put the number attached to x and x to the front of ln. Then, you apply the chain rule. Finally, you can simplify.



## - Origins of American Government -

Objective:

EQ: How can a Republic survive?

What is a Social Contract?

What's a Revolution?

How bloody are Revolutions?

What ways has Britain crossed the line?

What are some of the Acts listed?

When does America start working towards declaring independence?

What happens when we declare independence?

Students will determine if a Republic can survive if the people become immoral.

Vocab:

- Social Contract - the agreement between people and their government
  - ↳ We are born with rights but create government to protect our rights
- Revolution - overthrow of a government
  - ↳ there are all different kinds of revolutions

→ Revolutions are SUPER BLOODY to BLOODLESS to MEDIUM BLOODY (Super HOT to super cold)

### Britain Crosses the Line

- 1764 Sugar Act (TAX), Currency Act
- 1765 Stamp Act (TAX) on all official papers), Quartering Act
- 1766 Declaratory Act (colonists must obey)
- 1767 Townshend Act (another TAX)
- 1770 Boston Massacre
- 1773 Tea Act (TAX) and Boston Tea Party!
- 1774 Intolerable Acts (to force MA to obey)
- First Continental Congress issues Declaration and Resolves
- 1775 Give me liberty or give me death!
- Fighting breaks out!
- Second Continental Congress meets issues the olive Branch Petition to King George III
- King rejects it



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## - Protein Synthesis Overview -

**Objective:**

Students will review protein synthesis before starting their lab.

**EQ: What is protein synthesis?**

### Notes

There are 3 basic tests that can be used for protein quantitation:

What are tests used for protein quantitation?

1) Biuret Test

2) Lowry Assay

3) Bradford Assay

All assays use a spectrophotometer to quantitate protein concentrations ✓

What do assays use?

### • Biuret Test

When was the Biuret Test developed?

→ Oldest test (developed in 1833 by Ferdinand Rose)

→ Indicates relative amount of protein in a mixture

What is the color change for the Biuret Test?

→ Color change from light blue to violet occurs when peptide bonds interact with copper ions in an alkaline solution

→ Least accurate test

When was the Lowry Assay developed?

### • The Lowry Assay

→ Developed in 1951 by Oliver Lowry

→ Uses copper ions to cause a color change

What does dark mean for proteins?

→ Darker solution = more proteins

When was the Bradford Assay developed?

### • The Bradford Assay

→ Developed in 1976 by Marion Bradford

→ Uses a dye called Coomassie Brilliant Blue G-250 (Bradford Reagent) which interacts with the R groups



(continued)

Protein vs

No Protein :

→ No protein = reddish brown

→ Protein = blue

→ The darker blue the solution, the more protein you have ✓

What does darker blue mean?

How do scientists analyze proteins?

> To analyze proteins scientists use:

1) electrophoresis

2) chromatography

> Chromatography is used to separate complex mixtures into individual fractions

• SEC separates molecules based upon their size

• HIC is a separation technique that uses the properties of hydrophobicity to separate proteins from one another

• IEC separates molecules based upon their net charges

How is Chromatography used?

What is SEC, HIC, and IEC in Chromatography?

How large are proteins?

What is used to reduce the impact of electrical charge?

What does SDS do?

> Proteins are usually smaller than DNA fragments so a tighter matrix is necessary for separation during electrophoresis

• the chemical structure and charge of proteins is more complicated than DNA

• to reduce the impact of electrical charge on proteins, detergent sodium dodecyl sulfate (SDS) is added to the solution ✓

• SDS treatment and heating the protein denatures the overall structure allowing the protein to migrate through a gel.

Summary:

What is protein synthesis?

The three tests used to quantify proteins are Biuret test, Lowry Assay, and the Bradford Assay. Scientists analyze proteins using electrophoresis and chromatography.