QUIZ 3 STUDY GUIDE

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Know how to:

- Given the graph of a function, sketch the graph of its derivative (2.8.5)
- Given 3 graphs, determine which one is the graph of f, f', f'' (2.8.41)
- Recognize a limit as a derivative (3.7.32, 3.7.36)
- **Know how to find the derivative of a function**
  (1) Using the power rule ($(x^n)' = n(x^{n-1})$, valid for **all** nonzero numbers n, even $\frac{1}{2}$, or $\sqrt{2}$) (3.1.6, 3.1.8)
  (2) Using the sum rule ($(f+g)' = f'+g'$) and the constant multiple rule ($(cf)' = c(f')$) (3.1.23)
  (3) Using $(e^x)' = e^x$, as well as $(a^x)' = ln(a) \cdot a^x$ and $(ln(x))' = \frac{1}{x}$ (3.1.17, 3.1.32, 3.6.3, 3.6.16, 3.6.18)
  (4) Using the product rule ($(fg)' = (f')g + f(g')$) and the quotient rule ($(\frac{f}{g})' = \frac{(f')g - f(g')}{g^2}$) (3.2.15, 3.2.18, 3.2.24, 3.2.26)
  (5) Using derivatives of trigonometric functions ($(cos)' = -sin$, $(sin)' = cos$, $(tan)' = sec^2$) (3.3.10, 3.3.12, 3.3.24)
  (6) **Using the chain rule** ($(f \circ g)'(x) = g'(x) \cdot f'(g(x))$) (3.4.5, 3.4.13, 3.4.29, 3.4.42, 3.4.46, 3.4.50, 3.4.71)
  (7) Using implicit differentiation (3.5.11, 3.5.18, 3.5.27, 3.5.36, **3.5.54**)
  (8) Using logarithmic differentiation (3.6.30, 3.6.41, 3.6.42, 3.6.50)

  Note: Be sure to know how to combine those methods, and **THINK** about your problem before you tackle it!
- Find the equation of the tangent line to a graph at a point (3.1.35, 3.2.32, 3.3.24, 3.4.54, 3.5.28, 3.6.33)
- Find the equation of the normal line to a graph at a point (3.1.35)
- Find numbers where a tangent line to a graph is horizontal (3.1.51)
- Find n^{th} derivatives of functions (3.1.62)
- Solve word problems using derivatives (3.3.5, 3.3.37, 3.4.82, 3.7.10, 3.7.18), basically, derivatives represent rates of change
- Solve problems using $\lim_{x \to 0} \frac{sin(x)}{x} = 1$ (3.3.39, 3.3.46, 3.3.51)
- Solve the differential equation $y' = ky$ (i.e. $y = Ce^{kx}$), and use that formula in real-life situations (3.8.3, 3.8.5)
- Using $y' = ky$ and other information, find, for example C, or k, or $y(something)$ or the half-life of an element (3.8.9, 3.8.10)
- Solve problems using Newton's law of cooling (3.8.13, 3.8.15)

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Also, know how to **derive** the following (I won't ask any of that on the quiz, but you should know how to do that for the exam!)

- The derivative of a function using **the definition** of the derivative (2.8.21, 2.8.27, 2.8.28)
- The derivative of $csc(x)$, $sec(x)$, $cot(x)$ (this is just the quotient rule)
- The derivative of $f^{-1}(x)$ in terms of $f'(x)$ (3.6.67)
- The derivative of $ln(x)$ **and** the derivative of $ln(|x|)$
- The derivative of $cos^{-1}(x)$, $sin^{-1}(x)$, $tan^{-1}(x)$
- $e = \lim_{x\to 0}(1+x)^{\frac{1}{x}}$
- Second derivatives using the chain rule (3.4.95)
- The solution of $T' = k(T - T_s)$ (i.e. Newton's law of cooling)

Finally, know how to define the following (again, won't be on the quiz)

- The derivative of a functionn f at a
- f is differentiable at a, or on I (I is an interval)
- The sum, product, quotient, chain rules (**with all the assumptions**)
- e (the **new** definition: e is the number such that $\lim_{h\to 0}\frac{e^h-1}{h} = 1$