***** Non-calculator Exam**

Important Things to Know
Chapter 2 Test

Domain of any function

Limits

- Definition in your own words — y value as you approach from each side or as you approach from both sides

- At a point
  - Algebraically
    - Plug in
    - Factor, cancel, plug-in
  - Graphically

- $\lim_{x \to 0} \frac{\sin x}{x} = \boxed{1}$ $\sin(2x) = \boxed{2\sin x \cdot \cos x}$

- Limits involving Infinity
  - Vertical Asymptotes — The x-value that makes the denominator of a fraction equal zero OR on the side of a $y = \log x$

  - End Behavior Model (power function)
    - Comparing relative magnitudes of a function and their rates of change (x^2 vs. e^x)

      $y = e^x - 2x$ VS. $y = e^x(2x)$

    - $y = \frac{x^4 - 3x + 2}{-5x + 4}$ E.B.M. $y = -\frac{1}{5}x^3$

  - Horizontal Asymptotes (end behavior asymptotes)
    - Evaluate both $\lim_{x \to \infty} f(x) = \text{a}$ **and** $\lim_{x \to -\infty} f(x) = \text{b}$
    - Three possible answers when asked for Horizontal Asymptotes of a function
      - One solution: $y = a$ **or** $y = b$
      - Two solutions: $y = a$ **and** $y = b$
      - No solutions: both limits go toward ∞ and/or $-\infty$, therefore a H.A. d.n.e.

turn sheet over

Continuity

- In your own words don't lift up pencil when graphing
- Definition
  - $f(c)$ exists
  - $\lim_{x \to c} f(x)$ exists
  - $f(c) = \lim_{x \to c} f(x)$

  All three conditions must hold true
- Types of discontinuity

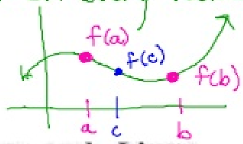
  Hole (removable) / Jump / Infinite
- How to make a piecewise function continuous

  example: $y = \begin{cases} 2x & x < 5 \\ 3ax & x \geq 5 \end{cases}$

  $2x = 3ax$
  $2(5) = 3a(5)$
  $10 = 15a$
  $\frac{10}{15} = a$

IVT – Intermediate Value Theorem

A function $f(x)$ that is continuous on a closed interval $[a, b]$ takes on every value between $f(a)$ and $f(b)$



There is a $f(c) = y$ value for every point between $f(a)$ and $f(b)$

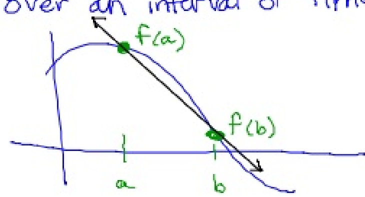
Rates of Change and Lines

- Various representations for Rates of Change

  Slope $\frac{y_2 - y_1}{x_2 \; x_1} = \frac{\Delta y}{\Delta x} = \frac{\Delta f}{\Delta x}$ velocity

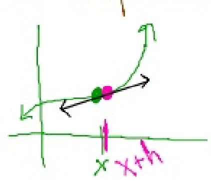
  Derivative
- ***Average*** Rate of Change – over an interval of time

  $\frac{f(b) - f(a)}{b - a}$



- ***Instantaneous*** Rate of Change – at a specific moment in time

  $\lim_{h \to 0} \frac{f(x+h) - f(x)}{(x-h) - (x)}$



Tangent Line

pt $(x\ f(x))$ and slope $f'(x)$ instantaneous slope

Normal Line

pt $(x, f(x))$ and slope $\perp f'(x)$ instantaneous slope