ID: _____

Calculus Exercise | Week 3 (2.5, 2.6, 2.7, 2.8) | Name: _____

2.5.30 Explain, using Theorems 4, 5, 7, and 9, why the function $B(u) = \sqrt{3u-2} + \sqrt[3]{2u-3}$ is continuous at every number in its domain. State the domain.

2.5.36 Use continuity to evaluate the limit $\lim_{\theta \to \pi/2} \sin(\tan(\cos\theta))$

2.5.44 Find the numbers at which f is discontinuous. At which of these numbers is f continuous from the right, from the left, or neither? Sketch the graph of f

$$f(x) = \begin{cases} 2^x & \text{if } x \leq 1 \\ 3 - x & \text{if } 1 < x \leq 4 \\ \sqrt{x} & \text{if } x > 4 \end{cases}$$

2.5.48 Find the values of a and b that make f continuous everywhere.

$$f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 \leq x < 3 \\ 2x - a + b & \text{if } x \geq 3 \end{cases}$$

2.5.58 Use the Intermediate Value Theorem to show that there is a solution of the given equation $\sin x = x^2 - x$ in the interval $(1, 2)$.

2.6.30 Find the limit of $\lim_{x \to -\infty} \left(\sqrt{4x^2 + 3x} + 2x \right)$ or show that it does not exist.

2.6.48 Find the horizontal and vertical asymptotes of the curve $y = \dfrac{2x^2 + 1}{3x^2 + 2x - 1}$. You may want to use a graphing calculator (or computer) to check your work by graphing the curve and estimating the asymptotes.

2.6.58 Find a formula for a function that has vertical asymptotes $x = 1$ and $x = 3$ and horizontal asymptote $y = 1$.

2.7.34 If the tangent line to $y = f(x)$ at $(4, 3)$ passes through the point $(0, 2)$, find $f(4)$ and $f'(4)$.

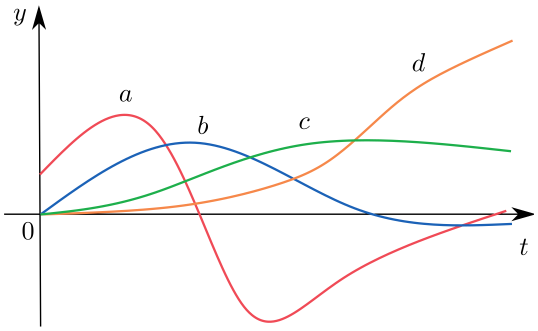
2.7.42 Sketch the graph of a function f where the domain is $(-2, 2)$, $f'(0) = -2$, $\lim_{x \to 2^-} f(x) = \infty$, f is continuous at all numbers in its domain except ± 1, and f is odd.

2.7.58 Determine whether $f'(0)$ exists, where

$$f(x) = \begin{cases} x^2 \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}.$$

2.8.40 Suppose N is the number of people in the United States who travel by car to another state for a vacation in a year when the average price of gasoline is p dollars per gallon. Do you expect $\frac{dN}{dp}$ to be positive or negative? Explain.

2.8.52 The figure shows the graphs of four functions. One is the position function of a car, one is the velocity of the car, one is its acceleration, and one is its jerk. Identify each curve, and explain your choices.



2.8.63 Recall that a function f is called *even* if $f(-x) = f(x)$ for all x in its domain and *odd* if $f(-x) = -f(x)$ for all such x. Prove each of the following

(a) The derivative of an even function is an odd function.

(b) The derivative of an odd function is an even function.