MATH251
Practice Exam I
Prof. Ross's Section

Name:

INSTRUCTIONS: Write legibly. Indicate your answer clearly in the space provided. Show all work; explain your answers. Answers with work not shown might be worth **zero** points.

Problem	Worth	Score
1	15	
2	10	
3	40	
4	10	
5	20	
6	30	
7	15	
Total	140	

(15) 1. Let $\mathbf{u} = \langle 2, -3 \rangle$ and $\mathbf{v} = \langle 5, -1 \rangle$. Find $\|\mathbf{u}\|, \|\mathbf{v}\|, \mathbf{u} \cdot \mathbf{v}$, and the vector projection of $\mathbf{u}$ onto $\mathbf{v}$.

(10) 2. Find all values of x such that $\langle 1, x \rangle \perp \langle 1 - 2x, x \rangle$

(40) 3. Find the indicated limits, or show they do not exist. Justify your answer.

(a) $\lim_{x \to 3} (3x+1)(2x-5)^{2008} = ?$

(b) $\lim_{t \to 2} \frac{t^2-4}{(t+1)^2-9} = ?$

(c) $\lim_{x \to \infty} \frac{3x^2-12}{2x^2+x+1} = ?$

(d) $\lim_{t \to 0} \frac{|t|}{t} = ?$

(e) $\lim_{\theta \to 0} \frac{\tan 3\theta}{\theta + \theta^2} = ?$

(10) 4. Derive the formula $\frac{d}{dx} \cos(x) = -\sin(x)$

(20) 5. Find all points where $f(x) = \frac{2x^3}{(x-5)(x^2-9)}$ is continuous, and find all asymptotes.

(30) 6. Find the derivatives.

(a) $f'(x)$, where $f(x) = 3x + \frac{x^2+7}{x-5}$

(b) $f'(x)$, where $f(x) = \tan \sqrt{2x-1}$

(c) $\frac{d}{dx}\left(\frac{x^2-1}{7x^3+17\sin(x)}\right)$

(15) 7. Prove one of the following statements:

(a) If $\mathbf{u}$ and $\mathbf{v}$ are vectors in $\mathbb{R}^n$, then $|\mathbf{u} \cdot \mathbf{v}| \leq \|\mathbf{u}\| \cdot \|\mathbf{v}\|$

(b) The sum of two functions continuous at a point x is continuous at x.

(c) State and prove the product rule for differentiation.