Calculus Practice Final Exam

■ **Answers must be exact and fully simplified. You may use a calculator.**

■ **Partial credit may be given for correct work, even when the answer is incorrect. Therefore, it is to your advantage to write clear solutions. If I cannot understand a solution within 120 seconds, then it will receive very little or no partial credit.**

■ **A1. Find each of the following limits or state that it does not exist even in the infinite sense.**

2.8-10 [1] $\lim_{\theta\to\infty} \frac{\sin^2\theta}{\theta^2-5}$

2.8-20 [2] $\lim_{\theta\to\infty} \frac{a_0 x^n + a_1 x^{n-1} + \cdots + a_{n-1} x + a_n}{b_0 x^n + b_1 x^{n-1} + \cdots + b_{n-1} x + b_n}$, where $a_0 \neq 0$, $b_0 \neq 0$, $n \in \mathbb{N}$.

■ **A2. State whether the indicated funtion is continuous at $x = 3$. If it is not continuous, tell why.**

2.9-12 [1] $r(t) = \begin{cases} \frac{t^3-27}{t-3} & \text{if } t \neq 3 \\ 23 & \text{if } t = 3 \end{cases}$

■ **B. The given limit is a derivative, but of what function and at what point?**

3.2-28 [1] $\lim_{h\to 0} \frac{(3+h)^2+2(3+h)-15}{h}$

■ **C. Find $\frac{dy}{dx}$ of each of the following.**

3.5-14 [1] $y = \sin^4(3x^2)$

3.5-35 [2] $y = \sin^3(\cos t)$

3.5-9 [3] $y = \frac{1}{(x+3)^5}$

■ **D. Answer the following.**

3.8-8 [1] $\frac{d}{dx}(x^2 y = 1 + y^2 x)$

3.9-13 [2] A metal disk expands during heating. If the radius increases at the rate of 0.02 inch per second, ho fast in the area of one of its faces increasing when its radius is 8.1 inches.

■ **E. Answer the following.**

5.2-16 [1] Find the xy-equation of the surve through (1, 2) whose slope at any point is three times the square of its y-coordinate.

p. 247 EX 2 [2] Find $\frac{d}{dx}\left(\int_2^x \frac{t^{3/2}}{\sqrt{t^2+17}}\,dt\right)$

■ G. Answer the following.

6.1-9 [1] Find the area between the curves $y = x - 1$ and $x = 3 - y^2$.

p. 289 Ex 3 [2] Find the volume of the solid generated by revolving the region in the first quadrant taht is above the parabola $y = x^2$ and below the parabola $y = 2 - x^2$ about the y-axis.

■ H. Answer the following.

p. 389 EX5 [1] Find $\frac{dy}{dx}$, if $y = x^x$, $x > 0$.

7.4-23 [2] Find $\int x\, 2^{x^2}\, dx$

■ I. Find the following.

8.1-27 [1] $\int \frac{\sin x - \cos x}{\sin x}\, dx$

5.8-15 [2] $\int x^2 \sin(6x^3 - 7)\, dx$

5.8-37 [3] $\int_0^1 x \sin(\pi x^2)\, dx$

p.289 EX4 [4] $\int x^2 \sin x\, dx$

p. 389 EX [5] $\int e^x \sin x\, dx$

8.4-37 [6] $\int \frac{\ln x}{\sqrt{x}}\, dx$