Calculus II Test #0 (Calculus I Review)

You have one hour to complete the test.
Show your work and clearly label your answers.
*No scrap paper, calculators, or notes are allowed.*
To get credit on a problem, you *must* give a *clear, well-written* explanation. An answer alone will not suffice.

READ, AND PRINT AND SIGN YOUR NAME BEFORE BEGINNING THE TEST.
I will neither give nor receive unauthorized assistance on this exam.
Printed Name _____ Signature _____

**Problem 1**   Solve the differential equation $y' = -6x$ for $y = f(x)$ subject to the initial condition $f(1) = 12$.

**Problem 2**   Compute $\frac{d}{dx}((\tan x)^5)$.

**Problem 3**   Compute $\int \cot(x)dx$.

**Problem 4**   Calculate the definite integral $\int_0^1 (3x^2 - 6x + 1)dx$.

**Problem 5**   Let $f(x) = x^3 h(x^4)$, and $\int h(x)dx = H(x) + C$. Compute $\int f(x)dx$.

**Problem 6**   Solve the differential equation $y' = -4y$ for $y = f(x)$ subject to the initial condition $f(0) = 14$.

**Problem 7**   Assume $g(x)$ is a twice-differentiable and integrable function over all real numbers and
$$f(x) = 7\ln(4x - 2) + 9\sin(g(x)) - \frac{3}{9x + 8}.$$

a)  What is the domain of $f$?

b)  Compute $f'(x)$.

c)  Let $g(x) = 7\pi x$. Compute $\int_0^2 f'(x)dx$.

**Problem 8**   Air enters a spherical balloon at the rate of 5 cubic feet per minute $(5\frac{\text{ft}^3}{\text{min}})$. Recalling that the volume of a sphere is $V = \frac{4}{3}\pi r^3$, where $r$ is the radius of the sphere, what is the rate of the radius' growth when the balloon's volume is 16 ft$^3$?

**Problem 9**   Compute

(a)   $\frac{d}{dx}(\log_4(x^5))$

(b)   $\int 7^{2x}dx$.

**Problem 10**   Considering only that the acceleration due to gravity is $-9.8\frac{m}{sec^2}$ in a vacuum on Earth, how high was an object dropped from rest if it took exactly 4 seconds to reach the surface?