1. 10 pts. Find the inverse of $g(x) = 2x^3 + 5$.

2. 10 pts. Find the derivative of the inverse of $f(x) = \tan(x)$ at the point $(1, \pi/4)$. It is not necessary to find f^{-1}.

3. 10 pts. For $f(x) = \ln\left(\dfrac{x+1}{x-3}\right)$, find $f'(x)$ and give the intervals on which the result is valid.

4. 10 pts. each Evaluate each integral

   (a) $\displaystyle\int \frac{2}{4x-3}\,dx$

   (b) $\displaystyle\int 3e^{-4t}\,dt$

   (c) $\displaystyle\int_0^5 5^{5x}\,dx$

   (d) $\displaystyle\int \frac{1}{x\sqrt{x^2 - 121}}\,dx$

5. 10 pts. Find the derivative using logarithmic differentiation:

$$f(x) = (\sqrt{x})^{\tan x}$$

6. 10 pts. each Find each derivative.

   (a) $s(t) = \cos(3^t)$

   (b) $g(x) = 4\log_7(x^2 - 1)$

   (c) $h(w) = \cos(\sin^{-1}(2w))$

   (d) $f(z) = \cot^{-1}(\sqrt{z})$

7. 10 pts. Evaluate the limit $\displaystyle\lim_{\theta \to \pi/2^-} (\tan\theta)^{\cos\theta}$ using L'Hôpital's Rule.

8. 10 pts. Evaluate using L'Hôpital's Rule:

$$\lim_{x \to 0} \left(\frac{\sin x}{x}\right)^{1/x^2}$$

9. 10 pts. each Evaluate each integral.

   (a) $\displaystyle\int x^2 e^{4x}\,dx$

   (b) $\displaystyle\int_0^{\pi/2} x\cos 2x\,dx$

   (c) $\displaystyle\int \sin^5 x \cos^{-2} x\,dx$

   (d) $\displaystyle\int_{-\pi/3}^{\pi/3} \sqrt{\sec^2\theta - 1}\,d\theta$

   (e) $\displaystyle\int \frac{1}{\sqrt{16 + 4x^2}}\,dx$

   (f) $\displaystyle\int \frac{x^2}{\sqrt{16 - x^2}}\,dx$