MAT 202 Test 1
Spring, 2013 Name_____

Work *one* bonus problem.

1. The function $f(x) = x^2 - 4x - 7$ is 1-to-1 on $[2, \infty)$. Find the inverse function. State its domain and range.

2. Find $\left(f^{-1}\right)'(5)$ for $f(x) = x^2 - 4x - 7$ $(x \geq 2)$ in 2 ways:
   a. Directly, by computing f^{-1} and evaluating $\left(f^{-1}\right)'(5)$, using work from #1.
   b. Using our theorem for derivative of the inverse (Theorem 7.1.1).

3. Find the derivative with respect to the given independent variable: Do not simplify.
   a. $\ln\left(\dfrac{x^3 - 17x}{(5x^2 + 27)^5}\right)$
   b. $\dfrac{x(x+1)(x-2)^3}{(x^2+1)(2x+3)}$
   c. 5^{3x+2}
   d. $(x^2 + 2x)^{x^2+2x}$
   e. $\log_3(5xe^{2x})$
   f. $\displaystyle\int_0^{x^2+3} \cos(5t)\,dt$

4. Evaluate the integrals
   a. $\displaystyle\int 7^x\,dx$
   b. $\displaystyle\int (x+1)\cdot 3^{x^2+2x}\,dx$

5. Solve the differential equation $\dfrac{d^2y}{dx^2} = 2e^{-x}$, $y(0) = 4, y'(0) = 3$

6. Compute the limits.

   a. $\lim_{x\to 1}\left(\dfrac{x^2-3x+2}{x-1}+\dfrac{x-1}{\cos\left(\dfrac{\pi}{2}x\right)}\right)$ (Hint: $\lim(f+g)=\lim f+\lim g$, provided the separate limits exist.)

   b. $\lim_{x\to\infty}\left(\left(1+\dfrac{4}{x}\right)^{\frac{4}{3x}}\right)$

7. Evaluate.

   a. $\sec^{-1}\left(\sqrt{2}\right)$

   b. $\sin^{-1}\left(-\dfrac{1}{2}\right)$

   c. $\tan\left(\sin^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)\right)$

   d. $\lim_{x\to-\infty}\left(\csc^{-1}(x)\right)$

Bonus Differentiate $y=\tan^{-1}\left(\sqrt{t-1}\right)$

Bonus Baby Bear's porridge comes out of the pot a blistering 200^0 Farenheit. The 3 Bears' cabin is a comfortable 68^0. If his porridge cools to 170^0 in 1 minute, how long does it take to get *just right* – a perfect 120^0?

Bonus Evaluate the integral: $\int_{\pi/3}^{\pi/2}\left(e^{\cot(w)}+1\right)\csc^2(w)\,dw$