Math 121: some extra review problems for Exam 1

1. Determine whether the following integral converges or diverges: $\displaystyle\int_2^\infty \frac{\sqrt{x}}{x-1}\,dx$.
2. Determine whether the following integral converges or diverges: $\displaystyle\int_2^\infty \frac{1}{x^2-x}\,dx$.
3. Show that the derivative of $\tan^{-1}(x)$ is $\frac{1}{1+x^2}$. (Hint: you may want to use the formula for the derivative of an inverse function that we discussed in the first week of class.)
4. Short answer: what does it mean to say that $\int_1^\infty f(x)\,dx$ diverges? Use a limit in your answer.
5. Short answer: why is the Fundamental Theorem of Calculus awesome?