Optimization and antiderivatives

November 9, 2016

Problems

Problem 1. Compute the following indefinite integrals:

1. for $n > 0$, find $\int \frac{dx}{\sqrt[n]{x}}$ (Be careful: the function is not continuous at $x = 0$.)

2. $\int \frac{dx}{x^2+4}$ (Hint: what is the derivative of $\arctan x$?)

Problem 2. Let $f(x) = \frac{1}{x^2}$, and $F(x)$ be an antiderivative of f with the property $F(1) = 1$. **True or false:** $F(-1) = 3$.

Problem 3. You are standing at ground level, and you throw a ball upward into the air with an initial velocity of 64 feet per second. The acceleration due to gravity is 32 feet per second squared (towards the ground). How much time is the ball in the air for? Use antiderivatives. What is the velocity of the ball at the time that it hits the ground?