Notesheet. Section 6.4: Fundamental Theorem of Calculus

Math 1210

Theorem 1 (Fundamental Theorem of Calculus)**.** If f is continuous on $[a, b]$, then

$$\int_a^b f(x)\ dx =$$

where F is any antiderivative of f.

Challenge 2. If R is the region under the graph of $f(x) = 2x$ on the interval $[1, 5]$, then find the area of R two different ways.

Challenge 3. Consider the curve $y = -x^2 + 9$. What is the area of the region bounded by the curve and the x-axis?

Challenge 4 (Negative area). Consider again the curve $y = -x^2 + 9$. Compute $A = \int_{-3}^{5} (-x^2 + 9)\ dx$. Can you shade the region whose area is A?

Challenge 5. The population of Calculusville grows at a rate of $900t^2 - 2{,}000t + 2{,}500$ people per month, where t is the number of months since November of 2017. What will be the net change in the population of Calculusville from January 2018 to February 2018.?

Challenge 6. Evaluate
$$\int_{2}^{3} \left(x^{-3} + x^{-1}\right)\ dx.$$