

The problems this week are the ones on the midterm. Note that it is important that you understand how to do these problems.

1. Let $y = f(x) = 3x^2 - 2x + 7$, and L_a the line tangent to the curve at $(a, f(a))$. Find, as functions of a , both the x - and y - intercepts of the line L_a . [10]
2. Let $y = g(x) = (2 + 5x)/(3 + x)$, and $x = f(y)$ be the inverse function. Compute the derivative of the inverse function f when $y = 0$. [10]
3. People who do carbon-14 dating use a figure of 5700 years for its half-life. A painting attributed to Vermeer (1632–1675), which should contain no more than 96.2% of its original carbon-14, contains 99.5% instead. About how old is the forgery? [10]
4. Water runs into a conical tank at the rate of $9 \text{ m}^3/\text{min}$. The tank stands point down and has a height of 10 m and a base radius of 5 m. How fast is the water level rising when the water is 6 m deep? (Recall that the volume of a cone is one-third the volume of the cylinder with the same height and radius) [10]