Worksheet week 4 - MAC 2312, Spring 2016 **NAME:** ____________________

1. Use FTC or geometry to evaluate each integral:

$(a)\ \int_0^3 |2x-1|\ dx$ $(b)\ \int_1^2 \frac{x^2+1}{x}\ dx$ $(c)\ \int_0^{\pi/3} \sec^2 x\ dx$

2. Find the average value of $f(x) = \frac{1}{x^2+1}$ on the interval $[-1, 1]$ and find all values of $x^* \in [-1, 1]$ so that $f(x^*)$ equals the average value of f on $[-1, 1]$. Why is such a value x^* guaranteed to exist?

3. Use substitution to compute each integral:

$(a)\ \int_e^{e^2} \frac{1}{x\sqrt{\ln x}}\ dx$ $(b)\ \int_0^1 \frac{x}{x^2+1}\ dx$

4. Given that $F(x) = \int_0^x \sqrt{8t - t^2}\, dt$, for $x \in [0, 8]$, do the following:

(a) Determine the values of $F(0)$, $F(4)$, $F(8)$. Hint: Complete the square and use geometry.
(b) Determine $F'(x)$ and $F''(x)$.
(c) Based on parts (a) and (b), sketch the graph of the function $y = F(x)$, for $x \in [0, 8]$. What kind of point is $x = 4$ for the graph of $y = F(x)$?