1. Sketch the graph of the function $f(x) = \frac{x^3}{(1 + x^2)^2}$ i.e.

(i) Find the zeroes of $f(x)$; determine where $f(x)$ is positive and where $f(x)$ is negative;
(ii) Find the local maxima and minima of $f(x)$, and determine which of these, if any, are absolute.
(iii) Does the graph have horizontal or vertical asymptotes?
(iv) Is the function odd? even? periodic? How is this reflected in the graph?

2. 

(a) For which value of $x$, if any, does the triangle $ABC$ have the largest area?
(b) For which value of $x$, if any, does the triangle $ABC$ have the smallest area?

3. State the three descriptions of $\int_a^b f(x)\,dx$ that were given in class. (As we did in class, you may assume that $a \leq b$.)

4. Calculate the area of the region $OABC$:

OA is the right half of the circle with center $(0, \frac{1}{2})$ and radius $\frac{1}{2}$
AB is the graph of $y = 1/(1 + x^2)$ where $0 \leq x \leq 1$
5. Let $F(x)$ be the antiderivative of the function $f(x)$ with $F(0) = 0$. The graph of $f(x)$ is drawn below.

Which of the following statements are true and which are false? Give a short argument supporting each of your answers.

True or False: $\int_0^2 f(x) \, dx > 2$

True or False: $\int_0^4 f(x) \, dx > 4$

True or False: $\int_{\frac{1}{2}}^1 f(x) \, dx > 3$

True or False: $\int_{\frac{1}{2}}^4 f(x) \, dx < -6$

True or False: $F(5) > 0$.

True or False: $y = F(x)$ has a local maximum in the interval $0 < x < 6$.

True or False: The graph of $F(x)$ has three inflection points in the interval $0 < x < 6$.

Sketch the graph of $y = F(x)$ using the information you got by answering the true/false questions.