Math 121. Hour Test II
10/23/1996

1. (15 points) a) Find remainder when $2x^3 - 3x^2 + 4x - 7$ is divided by $x - 2$.
b) Solve equation: $x^3 - x^2 - x + 1 = 0$

2. (10 pts). Write in standard form:
a) i^{103}
b)$(\frac{\sqrt{3}}{2} + \frac{1}{2}i)^3$

3. (10 points) a) write a polynomial $P(x)$ of degree 4 which has -1 as a root of multiplicity 3 and 3 as a root of multiplicity 1.

b) If $P(x)$ from a) is such that $P(x) \to +\infty$ for $x \to +\infty$ where $P(x)$ approaches when $x \to -\infty$?

4. (15 points) a) Find inverse function of $f(x) = \frac{x+3}{x+2}$.

b) Find the function graph of which is obtained from the graph of $y = |x|$ by a shift by 2 units left and 4 units down.

5. (15 points) a) Find the vertex and the line of symmetry of the graph of $f(x) = 6 - 2x - 4x^2$.

b) The profit from production at a price t dollars per unit is $400(15 - t)(t - 2)$. Which price per unite maximizes the profit?

6. (15 points). How much time is required for an investment to triple in value if the interest is earned at the rate 6.25% compounded monthly.

7. (20 points) a) Solve the following equation: $ln(3x - 1) - ln(x + 2) = 2ln5$.

b) A cup of coffee has cooled from $92°C$ to $50°C$ after 12 min. in a room at $22°C$. How long will the cup take to cool to $30°C$.

(Hint: Use the Newton's law of cooling which says that the temperature of an object at time t is $T(t) = T_m + (T_0 - T_m)e^{kt}$ where T_m is the temperature of surrounding medium, T_0 is the initial temperature and $T(t)$ is the temperature of the object at time t.