Math 10a

Practice Midterm 1 #2

1. Let $f(x) = \frac{1}{1+x^2}$.

   (a) What is the range of f?

   (b) Find a domain on which f is invertible and compute its inverse on that domain.

2. Compute the following limits or state if they do not exist:

   (a) $\lim\limits_{x \to \infty} \dfrac{3x^2}{x^2 + 1}$

   (b) $\lim\limits_{x \to 0} \dfrac{1}{x}$.

   (c) $\lim\limits_{x \to 0} \dfrac{x}{x + 3}$.

3. $f(x) = 6x^5 - 20x^3$

   (a) On what intervals is f increasing? Decreasing?

   (b) Where are the local maxima and local minima of f?

   (c) On what intervals is f concave up? Concave down?

   (d) Graph $f(x)$.

4. Let $P(t)$ model a population as a function of time. Suppose when there are P individuals in the population it grows at a rate proportional to $P(M - P)$.

   (a) Write down a differential equation for P.

   (b) When is P growing fastest?

5. Compute
$$\sum_{n=0}^{\infty} \frac{3 \cdot 3^{2n}}{4^{2n}}.$$