

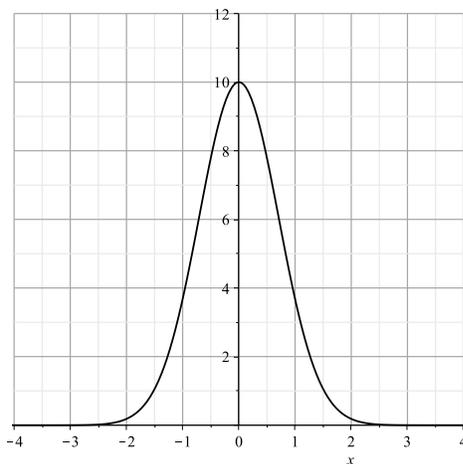
MA 151, Spring 2014, Midterm 1 preview:

Things to keep in mind as you take this practice test:

- The real test will not be this long. It will probably have around 8 problems.
- I tend to avoid harder problems on the test, but I don't avoid them much on the practice.
- You should know/memorize/write down the following:
 - the rules for exponents and adding, subtracting multiplying and dividing fractions,
 - the x and y intercepts of straight lines, and also e^x , $\ln(x)$,
 - how to solve equations that involve e^x and $\ln(x)$.
- Since this test is for practice you should think about doing variations of some of the problems, especially the ones that you find difficult.
- Everything should be done algebraically unless explicitly stated otherwise, or where it is not applicable, like a problem involving only the picture of a graph or a table of numbers. On the real midterm, whenever it's possible, I will require you to write algebraic steps that lead up to your answer, even in problems that involve a calculator.

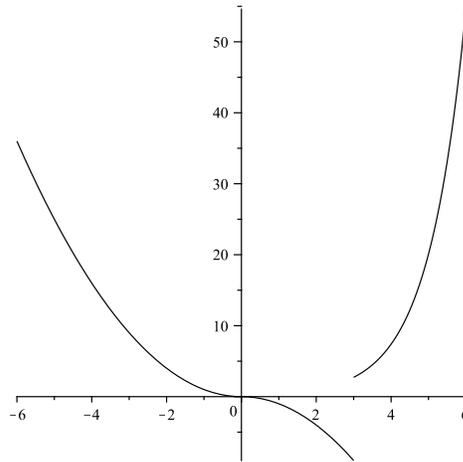
1. This problem refers to the graph below.

- Find $f(1)$, $f(-0.5)$.
- Solve $f(x) = 2$.



2. This problem refers to the graph below.

- On what intervals is the graph increasing? On what intervals is it decreasing?
- On what intervals is it concave up? On what intervals is it concave down?



3. Solve $f(x) = 3$ where $f(x) = 12x - 7$.
4. Find the equation of the line through the points $(3, 7)$ and $(-1, -10)$.
5. (Hughes-Hallett, 4e, 1.2#13) A company rents cars at \$40 a day and 15 cents a mile. It's competitor's cars are \$50 a day and 10 cents a mile.
 - (a) For each company, give a formula for the cost of renting a car for a day as a function of the distance traveled.
 - (b) On the same axes, graph both functions.
 - (c) How should you decide which company is cheaper?
6. (Hughes-Hallett, 4e, 1.3# 14) When a deposit of \$1000 is made into an account paying 8% interest, compounded annually, the balance, B , in the account after t years is given by $B = 1000(1.08)^t$. Find the average rate of change in the balance over the interval $t = 0$ to $t = 5$. Give units and interpret your answer in terms of the balance in the account.
7. Suppose a falling rock has position given by the following formula:

$$p(t) = -4.9t^2 + 13t + 10,$$

where p is measured in meters and t in seconds. Find the average velocity from $t = 1$ to $t = 2$ of the rock, including units.

8. A company is going to make a new kind of glue. To set up the factory, pay for the building, buy the machines, etc. will cost \$1,225,000. Each tube of glue will cost \$0.50 to make. They will sell each tube for \$2.
 - (a) Find a formula for the cost function, the revenue function, and the profit function.
 - (b) Find the break even point.
9. A company is making all electric sports cars. Their cost function is $C(q) = 10 + 1.5q$ where q is the number of cars they make and C is measured in millions of dollars.
 - (a) Suppose the company can sell 1 car if the price is at $p = 0.5$ (i.e. half a million dollars), and they can sell 10 cars if they price it at $p = 0.1$ (i.e. \$100,000). Assume that demand is linear and write a formula for the demand function.
 - (b) Combine your answer to part (a) with the cost function to have a formula for $C(p)$, i.e. cost as a function of price.

10. (Hughes-Hallett, 4e, 1.4#28) The demand curve for a product is given by $q = 120,000 - 500p$ and the supply curve is given by $q = 1000p$ for $0 \leq q \leq 120,000$, where price is in dollars.
- At a price of \$100, what quantity are consumers willing to buy and what quantity are producers willing to supply? Will the market push prices up or down?
 - Find the equilibrium price and quantity. Does your answer to part (a) support the observation that market forces tend to push prices closer to the equilibrium?
11. (Hughes-Hallett, 4e, 1.4#35) A supply curve has equation $q = 4p - 20$, where p is price in dollars. A \$2 tax is imposed on suppliers. Find the equation of the new supply curve. Sketch both curves.
12. Solve the following for x
- $7 = xe^6$
 - $7 = 2e^{3x}$
 - $\ln(x) = 7$
13. (Hughes-Hallett, 4e, 1.5#27) The 2004 US presidential debates questioned whether the minimum wage has kept pace with inflation. Decide the question using the following information: In 1938, the minimum wage was 25¢; in 2004, it was \$5.15. During that same period, inflation averaged 4.3%.
14. (Hughes-Hallett, 4e, 1.6#41) In 2000, there were about 213 million vehicles (cars and trucks) and about 281 million people in the U.S. The number of vehicles has been growing at 4% a year, while the population has been growing at 1% a year. If the growth rates remain constant, when is there, on average, one vehicle per person?