

M104, Practice Exam 2

Exam 2 is on Wednesday, February 27, 2013 in class in our usual classroom. The problems on the exam will be modeled on the ones here. Please work out the problems here in preparation for a class discussion on Monday, February 25. For each problem, you must show enough work to justify your answer.

(1) (30 points) Find $f'(x)$ for each of the following functions $f(x)$.

(a) $f(x) = \ln(x^2 + x)$ (b) $f(x) = \frac{x^2 + x + 3}{x^3 - 7x + 1}$

(c) $f(x) = (x^3 + 3x^2 - x + 7)^5$ (d) $f(x) = \ln(x)e^x$

(e) $f(x) = (x^3 + 3x^2 - x + 7)(6x^5 + 4x^4 - x^3 + 8x^2 - 12x + 13)$

(2) (24 points) Find the account balance A for a deposit of $P = \$125$ after $t = 10$ years, in each of the following scenarios.

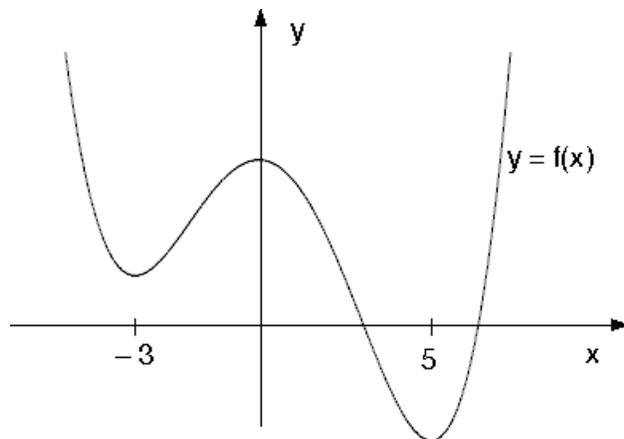
- (a) Simple interest at an annual rate of $r = 1\%$.
- (b) Compound interest at an annual rate of $r = 1\%$ compounded 4 times per year.
- (c) Continuously compounded interest at an annual rate of $r = 1\%$.
- (d) The doubling time is 70 years.

(3) (10 points) Which investment is better, one earning 5% interest compounded daily or one whose doubling time is 14 years.

(4) (10 points) Determine the open intervals on which $f(x) = x^4 - 4x^3$ is increasing and the open intervals on which $f(x) = x^4 - 4x^3$ is decreasing.

(5) (10 points) Determine the open intervals on which $f(x)$ is increasing and the open intervals on which $f(x)$ is decreasing if $f'(x) = x(x - 2)(x - 4)$.

(6) (8 points) Determine the open intervals on which $f(x)$ is increasing and the open intervals on which $f(x)$ is decreasing for the function $y = f(x)$ in the graph below.



(7) (8 points) Consider $y = f(x)$, where $f(x)$ has a vertical asymptote at $x = 1$, a horizontal asymptote at $y = 0$, $f'(x) = 0$ only at $x = 0$, $f(0) = 1$ and $f'(-1) < 0$, $f'(\frac{1}{2}) > 0$ and $f'(2) < 0$.

- (a) What are the critical values of $f(x)$?
- (b) Determine the open intervals on which $f(x)$ is increasing and the open intervals on which $f(x)$ is decreasing.
- (c) Sketch a graph of $y = f(x)$ taking into account all of the given information.