

LAST NAME:

Student no.:

Math 184 - Test - Monday September 24, six pages

Please show your work. I expect some arguments and, typically, correct final answers will not receive full credit if no arguments are given. If you use a logarithm, indicate the base. No aids allowed e.g. no calculators, no cellphones etc.

1. [3 marks] Given 7^2 is approximately 50, estimate $7^6/50$.
2. [3 marks] Give that $27^u = 5$ and $9^v = 4$, compute 3^{6u+2v} .
3. [3 marks] Compute $(e^{\ln 2})^4$. The functions $\ln x$ and e^x are (compositional) inverses.
4. [5 marks] Simplify $\ln(y) + \ln\left(\frac{e^{x^2}}{y}\right)$.

5. [3 marks] Is the function $f(x) = x^2 + 4x + 5$ always strictly positive ($f(x) > 0$)? Always strictly negative ($f(x) < 0$)? Or is $f(x) = 0$ for some x ?

6. [10 marks] Consider the following table of some values for a function f . Assume that f^{-1} exists. Compute as many table entries of f^{-1} and $f \circ f$ (also written as f^2) as you can and indicate with '-' that the values are unknown to you given the limited table of values.

x	0	1	2	3	4
$f(x)$	0	4	2	1	5
$f^{-1}(x)$					
$(f \circ f)(x)$					

7. [17 marks] You are operating a monopoly firm and consultants have told you that the demand q for your product as a function of the price p you choose is

$$q = 100 - p^{\frac{2}{3}}$$

- a) [2 marks] Give ranges on p , q which would be imposed to preserve reasonable answers.
- b) [4 marks] Give your revenue as a function of p .
- c) [7 marks] Give p as a function of q and then express your revenue R as a function of q .
- d) [4 marks] Imagine that you are dealing with the monopoly firm above. Assume there is some cost function $C(q) = c_1 + c_2q^3$ for some given constants c_1, c_2 . Assume there are no values for q in the feasible ranges of part (a) where $R(q) = C(q)$. What does this mean for the profitability of the firm?

8. [10 marks] Compute

$$\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{2x^2 - 4x - 6}$$

9. [10 marks] Compute

$$\lim_{x \rightarrow \infty} \frac{x^2 - x - 6}{2x^2 - 4x - 6}$$

10. [10 marks] Compute

$$\lim_{m \rightarrow \infty} \left(\frac{3m+1}{3m} \right)^{-4m}$$

11. [10 marks] Compute

$$\lim_{x \rightarrow 3} \frac{\sqrt{x}}{|x-3|}$$

12. [16 marks] You invest \$1000 at annual 6% interest, compounded monthly.

a) [5 marks] How much have you earned from your investment after 18 months. Give an expression for the answer in 'calculator ready form'.

b) [6 marks] How many months will be required in order for the investment to have doubled (answer in calculator ready form)?

c) [5 marks] Repeat (b) under the assumption that instead of monthly compounding, the interest is continuously compounded.