

MATH 111-002 200630 Problem Set 1

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Due: Thursday, September 21, 2006

This problem set will be quizzed during the last 20 minutes of tutorial on Thursday, September 21, 2006. One or two questions will be selected at random to be included on the quiz. Quiz problems will have only minor differences from the versions on this problem set.

1. Find the limit $\lim_{x \rightarrow \infty} \frac{2e^x - 1}{-3e^x + 2}$

2. Differentiate the functions

(a) $k(x) = (x^3 + 1)e^x$

(b) $m(x) = \sin(e^{x^2})$

3. Evaluate the integrals

(a) $\int_0^3 e^{2x} dx$

(b) $\int xe^{2x^2} dx$

4. Find the equation of the tangent line to the curve $y = e^x \sin(x)$ at the point $x = \pi$.

5. Graph the function $f(x) = e^{2x-x^2}$ showing intercepts, asymptotes, minima, maxima, inflection points, and regions where the function is increasing, decreasing, concave up, and concave down.

6. Find a formula for the inverse of each of the functions

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

(b) $g(x) = (x+2)^5$

7. Consider the function $h(x) = x^3 + 2x + 3$.

(a) Show that $h(x)$ is one-to-one.

(b) Find $(h^{-1})'(6)$.

8. Find the hundredth derivative of the function $p(x) = (x+50)e^{-x}$.

9. (a) Show that $e^x \geq 1 + x + \frac{x^2}{2}$ for $x > 0$. (Hint: see the questions near the end of section 7.2 in the textbook.)

(b) Use that result to estimate $\int_0^1 e^{x^2}$. What is the error in your estimate?

Practice questions which will not appear on the quiz but may appear on tests and on the final are

C-level 7.2: 15–16, 23–28, 29–42, 71–78; 7.1: 20, 21, 25–30, 39–42 (also show that f is one-to-one)

B-level 7.2: 45, 52, 58, 61–62, 83; 7.1: 23–24

A-level 7.2: 84–87 7.1: 45–48