

Math 111 Term Test 1

Edward Doolittle

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Please do each of the following questions. The entire exam is worth 45 marks. You should be able to earn about 1 mark per minute, and have 5 minutes left to check your work.

1. (10 marks) Find the following derivatives:

(a) y' where $y = e^{e^x}$

(b) y' where $e^{x^2y} = x + y$

(c) $\frac{d}{dt} \int_1^t e^{x^2+x+1} dx$

(d) y' where $y = \sqrt{1 + xe^{-2x}}$

2. (10 marks) Find the following integrals:

(a) $\int_0^5 e^{-3x} dx$

(b) $\int \frac{e^x + 1}{e^x} dx$

(c) $\int_0^1 xe^{-x^2} dx$

(d) $\int \frac{e^{-x}}{1 + e^{-2x}} dx$

3. (5 marks) Find the absolute maximum value of the function $g(x) = e^{2x-x^2}$.

4. (5 marks) Find the points of inflection of the function $g(x) = e^{2x-x^2}$.

5. (5 marks) Graph the function $g(x) = e^{2x-x^2}$ showing intervals of increase, decrease, local maxima and minima, intervals where the graph is concave up and down, and inflection points.

6. (5 marks) If $f(x) = 3 + x + e^x$, find $(f^{-1})'(4)$.

7. (5 marks) Show that $e^x \geq 1 + x$ if $x > 0$.