

**Name:** \_\_\_\_\_

**4-digit code:** \_\_\_\_\_

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

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Page	Max. points	Your points
2	30	
3	20	
4	30	
5	20	
<b>Total</b>	100	

**Problem 1** (10 pts). Use the limit definition of the derivative to compute  $f'(x)$  for  $f(x) = x^2 + x$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) =$$

**Problem 2** (10 pts). Find an equation of the tangent line to the graph of  $y = e^x \cos x$  at  $x = 0$ .

tangent line:

**Problem 3** (10 pts). Use logarithmic differentiation to compute the derivative of the function below:

$$f(x) = \frac{x^{3/4} \sqrt{x^2 + 1}}{(3x + 2)^5}$$

$$f'(x) =$$

Find the derivative of the following functions:

**Problem 4** (2 pts).  $f(x) = 4x$

$$f'(x) =$$

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**Problem 5** (2 pts).  $f(x) = 4x^{20}$

$$f'(x) =$$

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**Problem 6** (2 pts).  $f(x) = 4(x^2 + 3)^{20}$

$$f'(x) =$$

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**Problem 7** (2 pts).  $f(x) = 2^x$

$$f'(x) =$$

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**Problem 8** (2 pts).  $f(x) = 2^x x^{20}$

$$f'(x) =$$

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**Problem 9** (5 pts).  $f(x) = 2^x(x^2 + 3)^{20}$

$$f'(x) =$$

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**Problem 10** (5 pts).  $f(x) = 2^x(x^2 + 3)^{20} \ln x$

$$f'(x) =$$

**Problem 11** (2 pts).  $f(x) = \sqrt{x}$

$f'(x) =$

**Problem 12** (4 pts).  $f(x) = \frac{1}{\sqrt{x}}$

$f'(x) =$

**Problem 13** (6 pts).  $f(x) = \frac{\pi}{\sqrt{x}}$

$f'(x) =$

**Problem 14** (8 pts).  $f(x) = \frac{\pi}{\sqrt{x}} \tan x$

$f'(x) =$

**Problem 15** (10 pts).  $f(x) = \frac{\pi}{\sqrt{x}} \tan(\pi x)$

$f'(x) =$

**Problem 16** (20 pts). Compute  $\frac{dy}{dx}$  if  $x^3 + y^3 = 6xy$ . Find the tangent line to the curve at the point  $(3, 3)$ .

$$\frac{dy}{dx} =$$

tangent line: