

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.

| Page | Max. points | Your points |
|--------------|-------------|-------------|
| 2 | 30 | |
| 3 | 20 | |
| 4 | 30 | |
| 5 | 20 | |
| Total | 100 | |

Problem 1 (10 pts). Use the limit definition of the derivative to compute $f'(x)$ for $f(x) = x^3 + x$

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

$$f'(x) =$$

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). $f(x) = 4x$

$$f'(x) =$$

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

$$f'(x) =$$

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

$$f'(x) =$$

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

$$f'(x) =$$

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

$$f'(x) =$$

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

$$f'(x) =$$

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: