

PRINT NAME: _____

STUDENT ID NUMBER: _____

1. This is a take-home test.
2. You may consult books and notes and use a calculator.
3. Take as long as you want.
4. But you are not allowed to use any external help. You must do the work all by yourself.
5. Due Nov. 28.

Problem	Points	Score
1	15	
2	10	
3	30	
4	15	
5	10	
6	20	
Total	100	

2

1. (15 points) Find the tangent line of the curve

$$2x^2 + 3y^2 = 5$$

at the point $(-1, -1)$.

2. (10 points) Let $f(x) = e^{e^x}$. Find $f''(1)$.

4

3. (30 points) Find the derivatives of the following functions.

(a) (10 points) $f(x) = x^{\ln x}$

(b) (10 points) $f(x) = \sqrt[3]{x + \sqrt[5]{x}}$

(c) (10 points) $f(x) = \frac{e^x - 1}{e^x + 1}$

4. (15 points) Let $f(x)$ be a function that is twice-differentiable at 1 and let $F(x) = f(x^2)$. Suppose that $f(1) = 1$, $f'(1) = 2$ and $f''(1) = 3$. Find $F''(1)$.

6

5. (10 points) Find the limit

$$\lim_{x \rightarrow 0} \frac{\tan(2x)}{\sin(3x)}$$

using the identity

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1.$$

6. (20 points) At noon, ship A is 200 km east of ship B. Ship A is sailing east at 30 km/h and ship B is sailing north at 20 km/h. How fast is the distance between the ships changing at 10:00 P.M.?