

**MA 125, CALCULUS I**

Test 4, November 18, 2015

Name (Print last name first): .....

**Show all your work and justify your answer!**

**No partial credit will be given for the answer only!**

**PART I**

**You must simplify your answer when possible.**

**All problems in Part I are 8 points each.**

1. If  $f(x) = \ln(\sec(x))$ , find the derivative  $f'(x)$ . Recall that  $\sec(x) = \frac{1}{\cos(x)}$ .

2. Find the anti-derivative  $F(x)$  of the function  $f(x) = \tan(x)$ . Recall that  $\tan(x) = \frac{\sin(x)}{\cos(x)}$ .

3. Find the derivative of  $f(x) = e^{\sin(x)}$ .

4. Evaluate  $\int \frac{x^3 + 1}{x^4 + 4x} dx$

5. Solve  $e^{3x+2} = 9$ .

6. Solve  $\ln(2x + 1) = -2$ .

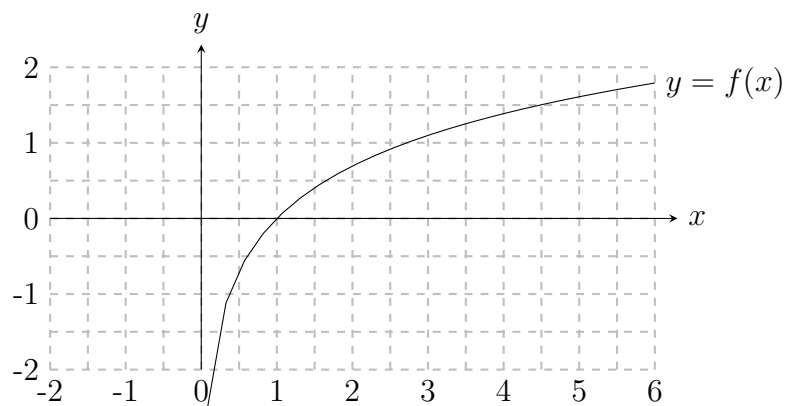
7. Use Newton's method to approximate the value of  $\sqrt{101}$ . Start with  $x_1 = 10$  and only compute the second approximate value  $x_2$ .
8. Set  $f(x) = x^5 + 2x + 1$ . Show that  $f(x)$  is one-to-one by studying monotonicity of  $f$ . Next compute the derivative  $(f^{-1})'(1)$

**PART II**

1. [8 points] Evaluate the integral

$$\int \frac{e^{\tan(x)}}{\cos^2(x)} dx$$

2. [12 points] Given the graph of  $y = f(x)$  below **read off** the graph the following:
- (1) the value of  $y = f(1.5)$
  - (2) the value of  $x = f^{-1}(1.5)$
  - (3) Estimate the derivative  $f'(2)$ . (Hint: draw the tangent line and estimate its slope).
  - (4) Estimate the derivative of  $(f^{-1})'$  at  $x = 1.5$ . (Hint: draw the tangent line and estimate its slope). **Indicate in the graph how you found your values!**



3. [16 points] Graph the function  $f(x) = x^2 \ln(x)$  for  $x > 0$ . Indicate in the graph:

(a)  $x$ - and  $y$ -intercepts

(b) Horizontal and Vertical asymptotes (if any). [Do  $\lim_{x \rightarrow 0^+} x^2 \ln(x)$  numerically by computing values at  $x = \frac{1}{10}$  and  $x = \frac{1}{100}$ .]

(c) Critical points, increasing, and decreasing.

(d) Local/Abs Max/Min, if any.

