

# MAT 125 Practice Final

**Name:**

**ID Number:**

**Read all of the following information before starting the exam:**

- Show all work, clearly and in order, if you want to get full credit. No work, no credit.
- Calculators are not permitted.
- Write clearly. If the grader is unable to understand what you have written, you may receive no credit.
- Attempt all problems.
- Good luck!

1. (25 points) Evaluate the following limits:

a. (5 pts)

$$\lim_{x \rightarrow 3} \frac{e^{x-3} - 1}{x - 3}$$

b. (5 pts)

$$\lim_{x \rightarrow 0} \frac{\sin(x) - x}{x^3}$$

c. (5 pts)

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$$

d. (5 pts)

$$\lim_{x \rightarrow 0^+} x \ln(x)$$

e. (5 pts)

$$\lim_{x \rightarrow 1} \frac{e^x - 1}{x - 2}$$

**2.** (20 points) Differentiate  $f(x)$ , with respect to  $x$ .

**a.** (5 pts)

$$f(x) = \sin(1 + 4x)$$

**b.** (5 pts)

$$f(x) = \sqrt{(1 + x \ln x)}$$

**c.** (5 pts)

$$f(x) = e^{-x}$$

**d.** (5 pts)

$$f(x) = (1 + 5x)^{20}$$

**3.** (25 points) Find  $\frac{dy}{dx}$  if

**a.** (5 pts)

$$y^5 + x^2y^3 = 1 + ye^{x^2}$$

**b.** (5 pts)

$$4 \cos x \sin y = 1$$

**c.** (5 pts)

$$\sin x + \cos y = \sin x \cos y$$

**d.** (5 pts)

$$(\ln 6)y = (\sin 3)e^5$$

**e.** (5 pts)

$$y = (1 + x^2)^3(1 + 3x)^{20}(1 + \sin x)^5\sqrt{(1 + 7x)}$$

4. (10 points) Find equation of the tangent line to the curve at the given point

a. (5 pts)

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2 \quad \text{at} \quad \left(0, \frac{1}{2}\right)$$

b. (5 pts)

$$y^2 = 5x^4 - x^2 \quad \text{at} \quad (1, 2)$$

**5.** (*60 points*) Section 4.2, problems 37 to 48 in the book. Plus all the homework problems.

**6.** (*45 points*) Section 4.1, problems 2, 3, 4, 5, 10, 11, 12, 26, 36 in the book. Solved examples 1, 2, 4 and 5 from section 4.1. Plus all the homework problems.

**7.** (*105 points*) Section 4.3, problems 7 to 16, problems 19 to 28 and problem 37 in the book. Plus all the homework problems.

**8.** (*25 points*) Section 4.6, problem 2, 3, 9, 13 and 15. Solved examples 1, 2 and 3 from section 4.6. Plus all the homework problems.