MATH 75B

Test 2

April 2, 2018

Name:_____

- No books, notes, or calculators are allowed.
- Please show all your work for problems 7-10.

Multiple choice questions: circle the correct answer

1. The linear approximation function is always

   A. constant **B.** positive **C.** of the form mx **D.** of the form $mx + b$
   E. none of the above

2. Find the linear approximation to $f(x) = \sin(x)$ at $a = 0$.

   A. $L(x) = 1$ **B.** $L(x) = x$ **C.** $L(x) = 1 + x$ **D.** $L(x) = x - 1$
   E. none of the above

3. Find the smallest possible perimeter of a rectangle with area 20.

   A. 9 **B.** $4\sqrt{5}$ **C.** 18 **D.** $8\sqrt{5}$
   E. none of the above

4. The Mean Value Theorem can be applied to which of the following functions on the interval $[-1, 1]$?

   A. $f(x) = \frac{1}{x}$ **B.** $f(x) = |x|$ **C.** $f(x) = x^3$ **D.** $f(x) = \ln x$
   E. none of the above

5. Which of the following is NOT true about the function $f(x) = e^x$?

   A. it is defined for all real numbers x **B.** its value is always positive
   C. it is increasing on $(-\infty, \infty)$ **D.** its graph is concave up on $(-\infty, \infty)$
   E. it has no horizontal or vertical asymptotes

6. Use Newton's method to approximate a root of the equation $x^3 + x^2 + 2x - 3 = 0$. Let $x_0 = 1$. Find x_1.

   A. -6 **B.** $\frac{6}{7}$ **C.** $\frac{8}{7}$ **D.** $\frac{7}{6}$
   E. none of the above

Regular problems: show all your work

7. A farmer wants to fence off a rectangular field of area $4,000$ square meters and then divide it into four pens with fencing parallel to one side of the rectangle. Find the dimensions of the field that minimize the amount of fence needed.

8. Use L'Hospital's rule to evaluate the following limits:

(a) $\lim_{x \to 1} \dfrac{\ln(x^2)}{x - 1}$

(b) $\lim_{x \to -\infty} xe^x$

9. Let $f(x) = xe^x$. Find the following:

(a) domain

(b) intercepts

(c) vertical and horizontal asymptotes

(d) critical numbers

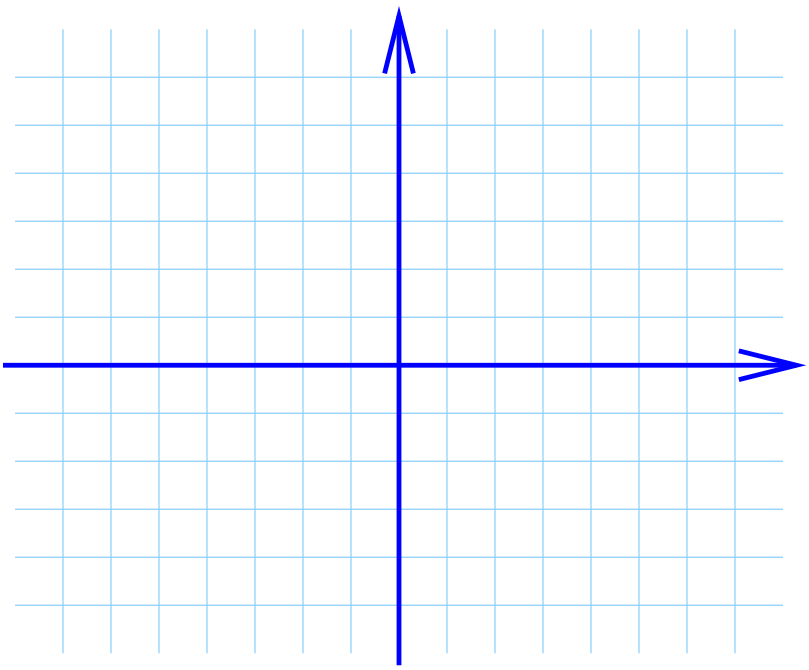
(e) intervals of increase and decrease

(f) local maximum and minimum values

(g) intervals of concavity

(h) inflection points

(i) sketch the graph of $f(x)$:



10. Prove that the equation $x^5 + 2x^3 + 3x + 5 = 0$ has exactly one real root.