Math 75B **Maria Nogin**

Practice test 2

Multiple choice questions: circle the correct answer

1. If $f(1) = 3$ and $f'(x) \le 2$, which of the following must be true about $f(4)$?

   A. $f(4) \le 6$ **B.** $f(4) \le 9$ **C.** $f(4) \le 11$ **D.** $f(4) \ge 5$ **E.** $f(4) \ge 8$

2. Use Newton's method to approximate the root of the equation $x^2 - 23 = 0$. Let $x_1 = 5$. Find x_2.

   A. 0 **B.** 0.3 **C.** 4.8 **D.** 5 **E.** 5.2

3. Which of the following functions is an antiderivative of $\sqrt{x}$?

   A. $2\sqrt{x}$ **B.** $\dfrac{1}{2\sqrt{x}}$ **C.** $\dfrac{3}{2}x^{\frac{3}{2}}$ **D.** $\dfrac{2x\sqrt{x}}{3}$

   E. none of the above

4. Which of the following is true about the function $f(x) = \ln x$?

   A. its domain is $(-\infty, \infty)$ **B.** it is increasing everywhere in its domain
   C. it is concave up everywhere in its domain **D.** it has one critical number
   E. none of the above

5. Which of the following functions has exactly one inflection point?

   A. $f(x) = \frac{1}{x}$ **B.** $g(x) = e^x$ **C.** $h(x) = x^2$ **D.** $j(x) = x^3$ **E.** $k(x) = \sin(x)$

6. Evaluate the limit: $\displaystyle\lim_{x\to 0} \frac{9^x - 3^x}{4^x - 2^x}$

   A. 3 **B.** $\frac{\ln 3}{\ln 2}$ **C.** 4 **D.** $\frac{\ln 6}{\ln 2}$

   E. none of the above

Regular problems: show all your work

7. Find the critical numbers and local maxima and minima of $f(x) = x^3 - 3x^2 + 5$.

8. Find the absolute maximum and minimum values of $f(x) = x^4 + 4x^3 + 5$ on the interval $[-2, 0]$.

9. Find the absolute maximum and minimum values of $f(x) = \sin x$ on the interval $\left[0, \dfrac{5\pi}{4}\right]$.

10. Show that the equation $x^7 + 3x^3 + x = 4$ has exactly one real root.

11. Let $f(x) = x^2 e^x$. Find the following:

    (a) Domain

(b) Intercepts

(c) Asymptotes

(d) Intervals of increase and decrease

(e) Local maximum and minimum points

(f) Intervals of concavity and inflection points

(g) Sketch the graph of $f(x)$

12. Find the dimensions of the rectangle of largest area that can be inscribed in an equilateral triangle of side 10 units if one side of the rectangle lies on the base of the triangle.

13. Find $f(x)$ if $f'(x) = 1 - 8x^3 + 2\sin x - \cos x$, $f(0) = 5$.