MATH 75B

Test 1

February 21, 2018

Name:_____

- No books, notes, or calculators are allowed.

- Please show all your work for problems 7-10.

- Please simplify your answers whenever possible.

Multiple choice questions: circle the correct answer

1. Let $f(x) = \arcsin(2x)$. Find $f'(x)$.

   A. $\dfrac{1}{\sqrt{1-2x^2}}$ **B.** $\dfrac{1}{\sqrt{1-4x^2}}$ **C.** $\dfrac{2}{\sqrt{1-2x^2}}$ **D.** $\dfrac{2}{\sqrt{1-4x^2}}$

   E. none of the above

2. Let $g(x) = x \ln x$. Find $g'(x)$.

   A. $1 + \ln x$ **B.** $\dfrac{1}{x}$ **C.** $\ln x - 1$ **D.** $\dfrac{e^x}{x}$

   E. none of the above

3. The length of a rectangle is increasing at a rate of 8 cm/s and its width is decreasing at a rate of 3 cm/s. When the length is 20 cm and the width is 10 cm, how fast is the area of the rectangle increasing?

   A. -24 cm^2/s   **B.** 5 cm^2/s   **C.** 20 cm^2/s   **D.** 140 cm^2/s

   E. none of the above

4. Find the critical number(s) of $f(x) = x^2 - 6x$.

   A. 3   **B.** 6   **C.** ± 6 **D.** 0

   E. none of the above

5. How many local maximum points does $y = \sin x$ have?

   A. 0   **B.** 1   **C.** 2   **D.** infinitely many

   E. none of the above

6. How many inflection points does $y = \ln x$ have?

   A. 0   **B.** 1   **C.** 2   **D.** infinitely many

   E. none of the above

Regular problems: show all your work

7. Consider the curve given by $x^2 - 2xy + y^3 = 43$.

   (a) Use implicit differentiation to find $y'(x)$.

   (b) Verify that the point $(-2, 3)$ lies on the above curve.

   (c) Find the slope of the tangent line to the above curve at the point $(-2, 3)$.

8. Car A is traveling north at 40 mi/h, and car B is traveling east at 50 mi/h. Both cars are approaching point P which is the intersection of the two roads. How fast is the distance between the two cars decreasing at the moment when car A is 30 mi and car B is 40 mi away from point P?

9. Find an equation of the tanget line to $y = \tan^{-1} x$ at $x = 1$.

10. Let $f(x) = \dfrac{x^2 + 4}{x}$. Find the following.

   (a) Domanin of $f(x)$

   (b) Critical points of $f(x)$, if any

   (c) Intervals of increase and decrease

(d) Local maximum and minimum points, if any

(e) Intervals of concavity

(f) Inflection points, if any