

MATH 75B

Test 1

February 25, 2019

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. Evaluate $\sin^{-1}\left(-\frac{1}{2}\right)$.

A. $\frac{\pi}{2}$

B. $-\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $-\frac{\pi}{6}$

E. none of the above

2. Let $f(x) = 4 \tan^{-1}(x)$. Find $f'(1)$.

A. 1

B. 2

C. 4

D. 8

E. none of the above

3. The radius of a circle is increasing at a rate of 2 cm/s. How fast is its area increasing when the radius is 3 cm?

A. 4π cm²/s

B. 6 cm²/s

C. 12π cm²/s

D. 24 cm²/s

E. none of the above

4. Find all critical points of $g(x) = x \ln x$.

A. $\frac{1}{e}$ only

B. $\frac{1}{e}$ and e

C. e only

D. -1 only

E. none of the above

5. Find the absolute maximum value of $y = x^3 - 12x$ on $[-3, 3]$.

A. -2

B. 0

C. 9

D. 16

E. none of the above

6. How many inflection points does $y = \frac{1}{x}$ 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 $3x^2y - 4\sqrt{x} + y^3 = 41$.

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

(b) Verify that the point $(4, 1)$ lies on the above curve.

(c) Find the slope of the tangent line to the above curve at the point $(4, 1)$.

8. A 10-ft-long ladder rests against a vertical wall. Misha starts pulling the bottom of the ladder away from the wall at a rate of 1 ft/s. How fast is the top of the ladder sliding down the wall at the moment when its bottom is 6 ft from the wall?

9. Find an equation of the tangent line to $y = \sin^{-1}(x)$ at $x = \frac{1}{\sqrt{2}}$.

10. Let $f(x) = \frac{9}{x} + x$. Find the following.

(a) Domain 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