APPM 1340
Exam 1
Fall 2023

Name		
Instructor Richard McNamara		**Section** 150

This exam is worth 100 points and has **4 problems**.

Make sure all of your work is written in the blank spaces provided. If your solutions do not fit, there is additional space at the end of the test. Be sure to **make a note** indicating the page number where the work is continued or it will **not** be graded.

Show all work and simplify your answers. Name any theorem that you use. Answers with no justification will receive no points unless the problem explicitly states otherwise.

Notes, papers, calculators, cell phones, and other electronic devices are not permitted.

There is a **FORMULA SHEET** on the **LAST PAGE** of this exam

End-of-Exam Checklist

1. If you finish the exam before 7:45 PM:
   - Go to the designated area to scan and upload your exam to Gradescope.
   - Verify that your exam has been correctly uploaded and all problems have been labeled.
   - Leave the physical copy of the exam with your proctors.
2. If you finish the exam after 7:45 PM:
   - Please wait in your seat until 8:00 PM.
   - When instructed to do so, scan and upload your exam to Gradescope at your seat.
   - Verify that your exam has been correctly uploaded and all problems have been labeled.
   - Leave the physical copy of the exam with your proctors.

1. (29 pts) Parts (a) - (d) are not related.

   (a) Factor the expression $x^3 + 3x^2 \quad 4x \quad 12$.

   (b) Consider the function $f(x) = (3 \quad \sqrt{x+1})(3 + \sqrt{x+1})$

      i.

(c) Solve the following equation for y in terms of x: $\frac{5 + y}{y} = 3x$

(d) Find all solutions, if any, of the equation $3x^{1/2} = 2x^{3/2}$

2. (28 pts) For the following, let point A be (5; 1), let point B be (3; 7), let segment AB be the line segment connecting points A and B, and let point M be the midpoint of segment AB.

   (a) Find the $(x; y)$ coordinates of point M.

   (b) Find an equation of the line that is perpendicular to segment AB and passes through point M.

(c) Find the length of segment AB.

(d) Find an equation of the circle that is centered at point M and passes through points A and B.

3. (18 pts) The following problems are not related.

(a) If sec = 5=2 and is on the interval (3 =2; 2), find the value of sin .

(b) Evaluate

(c) One end of a 12-foot rope is anchored to the ground and the other end is tied to the top of a vertical pole. If the rope has been pulled tight and it makes a 50 angle with respect to the ground, what is the height of the pole? Your answer should include a trigonometric function term and the correct unit of measurement.

4.

(b) Find the length of the arc that is subtended by an angle of 36 on a circle of radius 20 ft. Include the correct unit of measurement.

(c) Is the function $g(x) = (x \quad 1)^2$ odd, even, or neither? Justify your answer by using the definition of odd and/or even functions.

END OF TEST

Your Initials _________

ADDITIONAL BLANK SPACE

If you write a solution here, please clearly indicate the problem number.

Potentially Useful Formulas

Sector of a circle:

Arc length: $L = \ r$

Area: $A = \frac{1}{2}\ r^2$

Pythagorean identities:

$\sin^2 \ + \cos^2 \ = 1$
$\tan^2 \ + 1 = \sec^2$
$1 + \cot^2 \ = \csc^2$

Sums and differences:

$\sin(\quad) = \sin \ \cos \quad \cos \ \sin$
$\cos(\quad) = \cos \ \cos \quad \sin \ \sin$

Double-angle formulas:

$\sin 2 \ = 2 \sin \ \cos$
$\cos 2 \ = \cos^2 \quad \sin^2 \ = 2\cos^2 \quad 1 = 1 \quad 2\sin^2$