APPM 1340
Exam 1
Fall 2022

Name	
Student ID	
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. (28 pts) The following problems are not related.

   (a) Express the following as a polynomial: $(\sqrt{x-3}+2)(\sqrt{x-3}-2)$

   (b) Fully simplify: $\sqrt{a^2b^7}$

(c) Fully simplify: $\dfrac{\frac{1}{x+h} - \frac{1}{x}}{h}$

(d) Solve: $x^{7/3} - 15x^{1/3} = 2x^{4/3}$

2. (22 pts) For the following, let point A be $(2, 1)$ and let point B be $(-6, 7)$:

   (a) Find the distance between points A and B.

   (b) Find a point-slope equation of the line passing through points A and B.

(c) Find the midpoint of the line segment connecting points A and B.

(d) Find the equation of the line that is perpendicular to the line in part (b) and passes through the origin.

3. (22 pts) The following problems are not related.

(a) If θ is on the interval $\left[\frac{\pi}{2}, \pi\right]$ and $\tan\theta = -\frac{5}{2}$, find the value of $\csc\theta$.

(b) Evaluate $\cos\left(\frac{3\pi}{4}\right)$.

(c) The height of a building is known to be 555 feet. A person standing a certain distance away measures the angle from their feet to the top of the building to be 60°. How far away is the person from the building? Express your answer in exact form and include the proper unit of measurement.

4. (28 pts) The following problems are not related.

   (a) Find all values of x in the interval $[0, 2\pi]$ that satisfy the equation $\sin(2x) = \cos x$.

(b) What is the radius of a circular sector having a central angle of 40° and an area of 4π?

(c) Is the function $f(x) = x^7 + 3x^3 - 1$ 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

Quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Distance between two points: $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint of a line segment: $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right)$

Forms of the equation of a line:

point-slope: $y - y_1 = m(x - x_1)$
slope-intercept: $y = mx + b$

Equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$

Equations of a parabola:

$y = ax^2 + bx + c$
$y = a(x - h)^2 + k$

Sector of a circle:

Arc length: $L = \theta r$

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

Pythagorean identities:

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

Sums and differences:

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$
$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

Double-angle formulas:

$\sin 2\theta = 2\sin\theta\cos\theta$
$\cos 2\theta = cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$

Even and odd functions:

Even: $f(-x) = f(x)$
Odd: $f(-x) = -f(x)$