

**INSTRUCTIONS:** Books, notes, and electronic devices are not permitted. Write (1) **your full name**, (2) **1340/Exam 1**, (3) **lecture number/instructor name** and (4) **FALL 2021** on the front of your bluebook. Do all problems. **Start each problem on a new page.** **Box** your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit. **Justify your answers, show all work.**

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1. (28pts) The following problems are not related. Show all work. Simplify your answers.

(a)(20pts)(i)(10pts) Assume  $x$  is a positive real number and find the product:  $(x^{1/2} - x^{3/2})^2$

(ii)(10pts) Assume  $p \in \mathbb{R}$  and  $p > 0$  and perform the indicated operation (write your answer with positive exponents only):  $(p + 4)^{-3/2} + (p + 4)^{1/2}$

(b)(8pts) Use the Quadratic Formula to solve the equation:  $x^2 - x = 1$

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2. (24pts) The following problems are not related. Show all work. Simplify your answers

(a)(10pts) Assuming all the variables are positive, simplify the rational expression:  $\frac{p^{-1} + q^{-1}}{(pq)^{-1}}$

(b)(10pts) Solve the equation by factoring the polynomial:  $18x^2 + 9x - 2 = 0$

(c)(4pts) Which choice below is equivalent to  $\sqrt{\frac{g^3 h^5}{r^3}}$  if all the variables are positive? **Choose only one answer.** *No justification necessary, copy down the entire answer. If you do not copy down the entire answer, points will be deducted.*

(A)  $\frac{g^6 h^{10}}{r^6}$

(B)  $\frac{g^{3.2} h^{5.2}}{r^{3.2}}$

(C)  $\frac{gh^2 \sqrt{ghr}}{r^2}$

(D)  $\frac{gh^2 \sqrt{gh}}{r}$

(E) None of these

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3. (20pts) The following problems are not related. Show all work. Simplify your answers.

(a)(10pts) Find all solutions of the equation  $\sin^2(\theta) \cos(2\theta) = \cos(2\theta)$  that are in the interval  $0 \leq \theta < 2\pi$ .

(b)(10pts) Write down the *piecewise* definition of the function  $f(x) = 1 + |x^2 - 4|$ .

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4. (28pts) The following problems are not related. Show all work. Simplify your answers

(a)(12pts) Use the formula  $\cos(A + B) = \cos(A) \cos(B) - \sin(A) \sin(B)$  and the fact that  $75^\circ = 30^\circ + 45^\circ$  to find the exact value of  $\cos(75^\circ)$ .

(b)(12pts) Suppose  $\frac{\pi}{2} \leq \theta \leq \pi$ , find  $\tan(\theta)$  given that  $\sin(\theta) = \frac{1}{3}$ .

(c)(4pts) If we solve the equation  $1 + x + xy = y - xy$  for variable  $x$  then which choice below is equal to  $x$ ? **Choose only one answer.** *No justification necessary, copy down the entire answer. If you do not copy down the entire answer, points will be deducted.*

(A)  $x = y - 1$       (B)  $x = \frac{y - 1}{2y + 1}$       (C)  $x = \frac{y}{1 + 2y}$       (D)  $x = \frac{2y - 1}{1 + y}$       (E) None of these

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