MA 231 Exam 1/Green Spring 2013

Student's Name: _____

Student's ID Number: _____

MA 231 Sections:

0011 8:30 Greg Hurst	0021 9:30 Greg Hurst
0031 10:30 Lidia Mrad	0041 11:30 Lidia Mrad

Instructions:

1. **Do NOT turn the page until told to do so**.
2. Fill in your name and student ID in the space provided above.
3. On the scantron, fill in your name, section number, student ID. Leave the test/quiz number blank. Sign your name.
4. There are 12 problems and a total of 7 pages (including this cover page). The maximum possible score for this exam is 100, and each problem is worth the same points.
5. You can use the available space at the back of each page or below a question for your work. Turn in ONLY the scantron when you leave. Note: **you will be graded ONLY based on your scantron answer sheet**.
6. A one-line display scientific calculator is allowed. A two-line display scientific calculator with NO capacities in computing derivatives and integrals is also allowed. NO other electronic devices are allowed. No books or notes are allowed.
7. You will have 60 minutes to complete the exam.
8. **Keep your eyes on your own exam please. Try to cover your bubbled in scantron answers.**
9. **Good luck!**

MA 23100 - Exam 1 (Green)

1. Solve $3x^2 - 4x = 1$.

   A. $x = \frac{1}{3},\ x = 1$
   B. $x = \frac{4}{3},\ x = -1$
   C. $x = \frac{2 \pm \sqrt{7}}{3}$
   D. $x = \frac{2 \pm \sqrt{14}}{6}$
   E. $x = \frac{1 \pm 2\sqrt{14}}{3}$

2. Find the domain of $f(x) = \dfrac{x^2 + 5x + 6}{x^2 + 4x + 3}$.

   A. $\{x \mid x \text{ is a real number and } x \neq -3 \text{ and } x \neq -2\}$
   B. $\{x \mid x \text{ is a real number and } x \neq -1\}$
   C. $\{x \mid x \text{ is a real number and } x \neq -2\}$
   D. $\{x \mid x \text{ is a real number and } x \neq -3 \text{ and } x \neq -1\}$
   E. $\{x \mid x \text{ is a real number and } 0 < x < 3\}$

3. $\cot^2 x - \cos^2 x$ simplifies to

   A. $\cos^2 x \sin^2 x$
   B. $\cot^2 x \cos^2 x$
   C. 1
   D. $\sin^2 x$
   E. $\sin^4 x$

4. Give a periodic function of the form $f(x) = a \sin(bx) + k$, where $f(x)$ has a average value of 9, minimum value of 3, and a period of 8.

   A. $f(x) = 6 \sin(8x) + 9$
   B. $f(x) = 9 \sin(8x) + 6$
   C. $f(x) = 3 \sin(8x) + 9$
   D. $f(x) = 9 \sin\left(\frac{\pi x}{4}\right) + 6$
   E. $f(x) = 6 \sin\left(\frac{\pi x}{4}\right) + 9$

5. If the temperature remains constant, the pressure of an enclosed gas is inversely proportional to the volume. The pressure of helium within a spherical balloon of radius 9 inches is 20 lb/in^2.

   The volume of a sphere with radius r is given by $V = \frac{4}{3}\pi r^3$. If the radius of the balloon increases to 12 inches what is the pressure of the gas?

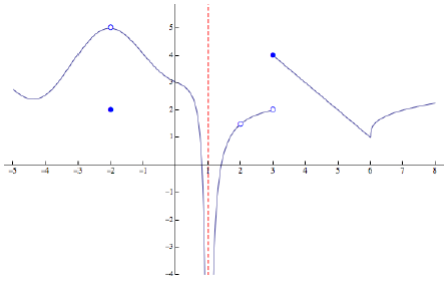
   A. 26.67 lb/in^2
   B. 8.438 lb/in^2
   C. 0.119 lb/in^2
   D. 21.917 lb/in^2
   E. 15 lb/in^2

6. Given that the solutions to $2x^2 + x - 1 = 0$ are $x = \frac{1}{2}$ and $x = -1$, solve

$$2\sin^2(3x) + \sin(3x) - 1 = 0.$$

   A. $x = \frac{\pi}{18} + \frac{2\pi n}{3}, x = \frac{5\pi}{18} + \frac{2\pi n}{3}, x = \frac{\pi}{2} + \frac{2\pi n}{3}$
   B. $x = \frac{\pi}{6} + \frac{2\pi n}{3}, x = \frac{5\pi}{6} + \frac{2\pi n}{3}, x = \frac{\pi}{2} + \frac{2\pi n}{3}$
   C. $x = \frac{\pi}{6} + 2\pi n, x = \frac{5\pi}{6} + 2\pi n, x = \frac{3\pi}{2} + 2\pi n$
   D. $x = \frac{\pi}{18} + 2\pi n, x = \frac{5\pi}{18} + 2\pi n, x = \frac{\pi}{2} + 2\pi n$
   E. $x = \frac{\pi}{9} + 2\pi n, x = \frac{2\pi}{9} + 2\pi n, x = \frac{3\pi}{2} + 2\pi n$

Consider the plot of $f(x)$ below for the next two problems.



7. Find the number of correct statements.

   I. There are four discontinuities shown above.
   II. It is possible to define $f(3)$ so that $f(x)$ is continuous at $x = 3$.
   III. $f(x)$ is discontinuous on the interval $(4, 7)$.
   IV. It is possible to define $f(2)$ so that $f(x)$ is continuous at $x = 2$.

   A. There are zero correct statements
   B. There is only one correct statement
   C. There are only two correct statements
   D. There are only three correct statements
   E. All statements are correct

8. In the plot above, if $a = \lim_{x \to -2} f(x)$ and $b = \lim_{x \to 3^-} f(x)$, find ab.

   A. 8
   B. 4
   C. 20
   D. 10
   E. 15

9. Evaluate $\lim_{x\to 4} \dfrac{(x-4)^3}{(x^2+3x-28)^3}$.

   A. $\frac{1}{1330}$
   B. $\frac{1}{1331}$
   C. $\frac{1}{1332}$
   D. $\frac{1}{1333}$
   E. $\frac{1}{1334}$

10. Find the simplified difference quotient of $f(x) = 3x^2 - 5x + 7$.

    A. $3h^2 + 6hx - 5h - 10x + 14$
    B. $3h - 5$
    C. $6x - 5 + 3h$
    D. $6x - 5 + 3h^2$
    E. $3h + 5$

11. Given the derivative of $f(x) = x^2 - \dfrac{1}{x}$ is $f'(x) = 2x + \dfrac{1}{x^2}$, find the equation of the tangent line to $f(x) = x^2 - \dfrac{1}{x}$ at the point $x = 1$.

    A. $y = 3x - 3$
    B. $y = 3x + 1$
    C. $y = x - 1$
    D. $y = 2x - 4$
    E. $y = 2x - 2$

12. If $f(x) = \left(x - x^2\right)^2 - 3\sin x$, find $f'(\pi)$.

    A. $4\pi^3 - 4\pi^2 - 3$
    B. $-2\pi^2 + 2\pi - 3$
    C. $-2\pi^2 + 2\pi + 3$
    D. $4\pi^3 - 6\pi^2 + 2\pi - 3$
    E. $4\pi^3 - 6\pi^2 + 2\pi + 3$