MA 16500
EXAM 2 INSTRUCTIONS
VERSION 01
October 17, 2012

Your name _____ Your TA's name _____

Student ID # _____ Section # and recitation time _____

1. You must use a #2 pencil on the scantron sheet (answer sheet).

2. Check that the cover of your question booklet is GREEN and that it has VERSION 01 on the top. Write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron sheet, fill in your TA's name (NOT the lecturer's name) and the course number.

4. Fill in your NAME and PURDUE ID NUMBER, and blacken in the appropriate spaces.

5. Fill in the four-digit SECTION NUMBER.

6. Sign the scantron sheet.

7. Blacken your choice of the correct answer in the spaces provided for each of the questions 1–12. Do all your work on the question sheets. Show your work on the question sheets. Although no partial credit will be given, any disputes about grades or grading will be settled by examining your written work on the question sheets.

8. There are 12 questions, each worth 8 points. The maximum possible score is

$8 \times 12 + 4$ (for taking the exam) $= 100$ points.

9. NO calculators, electronic device, books, or papers are allowed. Use the back of the test pages for scrap paper.

10. After you finish the exam, turn in BOTH the scantron sheets and the exam booklets.

11. If you finish the exam before 7:25, you may leave the room after turning in the scantron sheets and the exam booklets. If you don't finish before 7:25, you should REMAIN SEATED until your TA comes and collects your scantron sheets and exam booklets.

Questions

1. We have a function $F(x) = f\left(g\left(h(x)\right)\right)$ such that

$$\begin{cases} h(1) = 3 & h(2) = 2 & h(3) = 1 \\ g(1) = 4 & g(2) = 5 & g(3) = 6 \\ f(4) = 7 & f(5) = 9 & f(6) = 11 \end{cases}$$

and that

$$\begin{cases} h'(1) = 5 & h'(2) = -2 & h'(3) = -7 \\ g'(1) = 2 & g'(2) = -3 & g'(3) = 4 \\ f'(4) = -3 & f'(5) = 7 & f'(6) = 8 \end{cases}$$

Find $F'(1)$.

A. 26

B. 20

C. -90

D. 160

E. 198

2. Find the exact value for each of the expressions below.

(a) $\sin^{-1}\left(\sin(\frac{8\pi}{3})\right)$

(b) $\cos\left(\tan^{-1}(\frac{12}{5})\right)$

A. (a) $\frac{8\pi}{3}$ (b) $\frac{5}{13}$

B. (a) $\frac{2\pi}{3}$ (b) $\frac{12}{13}$

C. (a) $\frac{2\pi}{3}$ (b) $\frac{5}{13}$

D. (a) $\frac{\pi}{3}$ (b) $\frac{12}{13}$

E. (a) $\frac{\pi}{3}$ (b) $\frac{5}{13}$

3. If we use the linear approximation for $f(x) = \sqrt[3]{5+3x}$ at $a = 1$, then the estimate for $\sqrt[3]{8.06}$ is

A. 2.01

B. 2.06

C. 2.005

D. 2.03

E. 2.02

4. Find the equation of the tangent to the curve defined by

$$e^{x/y} = 3x - y$$

at the point $(0, 1)$

A. $x = 0$

B. $y = 1$

C. $y = x + 1$

D. $y = ex + 1$

E. $y = 2x + 1$

5. Find the formula for $\cos(2\arctan(x))$.

A. $\frac{1-x}{\sqrt{1+x^2}}$

B. $\frac{1-x^2}{1+x^2}$

C. $\frac{2x}{1+x^2}$

D. $\frac{1}{\sqrt{1+x^2}}$

E. $\frac{x}{\sqrt{1+x^2}}$

6. Find $\frac{dy}{dx}$ when $y = (\cos x)^{\sin x}$.

A. $(\cos x)^{\sin x - 1}$

B. $\ln(\cos x) \cdot (\cos x)^{\sin x}$

C. $(\cos x)^{\sin x}\{\cos x \cdot \ln(\cos x) - \sin x \cdot \tan x\}$

D. $(\cos x)^{\sin x}\{\cos x \cdot \ln(\cos x) + \tan x\}$

E. $(\sin x)^{\sin x} + (\cos x)^{\cos x}$

7. The position of a particle is given by the function $s = f(t) = 2t^3 - 9t^2 + 12t$. Find the total distance traveled during the time period between $t = 0$ and $t = 3$.

A. 9

B. 10

C. 11

D. 12

E. 13

8. A particle is moving along the curve $x^3y^3 = 8$. As it reaches the point $(1, 2)$, the y-coordinate is decreasing at a rate of 3 cm/sec. What is the rate of the change of the x-coordinate of the particle at that instant ?

Note: The unit for measuring the coordinate length is given by "cm".

A. $\frac{1}{2}$ cm/sec

B. $\frac{3}{2}$ cm/sec

C. $-\frac{3}{2}$ cm/sec

D. 3 cm/sec

E. -3 cm/sec

9. Compute $\frac{d}{dx}\left(\sinh(\ln x)\right)$ when $x = 2$.

A. $\frac{3}{4}$

B. $\frac{5}{8}$

C. $\frac{5}{4}$

D. $\frac{3}{8}$

E. $\frac{1}{4}$

10. Two girls start walking from the same point. One travels south at 3 mi/h and the other travels west at 4 mi/h. At what rate is the distance between the two girls increasing after two hours ?

A. 5 mi/h

B. 6 mi/h

C. 7 mi/h

D. 8 mi/h

E. 9 mi/h

11. A ladder 10 ft long leans against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/sec, how fast is the angle between the ladder and the ground decreasing when the bottom of the ladder is 6 ft away from the wall ?

A. $\frac{1}{2}$ rad/sec

B. $\frac{1}{4}$ rad/sec

C. $\frac{1}{8}$ rad/sec

D. $\frac{\pi}{8}$ rad/sec

E. $\frac{1}{10}$ rad/sec

12. Water is leaking out of an inverted conical tank at a rate of 5 m^3/min at the same time that water is being pumped into the tank at a constant rate. The tank has height 60 m and the diameter at the top is 40 m at the top. If the water level is rising at a rate of 0.2 m/min when the height of the water is 30 m, find the rate at which water is being pumped into the tank.

A. 20π

B. $20\pi + 5$

C. $20\pi - 5$

D. 60π

E. $60\pi + 5$