Econ 100A Mathematics Diagnostic Exam

Instructions: This exam is designed to help you determine whether you are mathematically prepared for Econ 100A. The first two questions test your ability to do "story" problems. We will be doing a lot of these this term. The remaining questions test your knowledge of simple calculus. Answers are found on the Econ 100A website. IF you missed any of the calculus problems, be sure to brush up on the calculus that you need in order to solve them. You will not be able to do satisfactory work in this class, unless you are tooled up to do problems like this.

Mark the scantron answer sheet carefully with pencil (not ballpoint). If you need to erase, make sure that you do it thoroughly. You may keep your question sheet. If you want a record of what you did on each question, circle the answer on your question sheet.

1. A quart of vodka is 40% alcohol. The following is a formula for the percentage of alcohol in a mixture of V quarts of vodka and J quarts of orange juice.

(a) $100(.4V/(.4V + J))$

(b) $100(.4V/(V + J))$

(c) $100(V/.4(V + J))$

(d) $100(.4V/(.6V + J))$

(e) none of the above.

2. The government imposes an income tax such that everyone has to pay a tax equal to 6% of her income in excess of V^* and no taxes if her income is V^*. Could it happen that someone's taxes are equal to exactly 5% of her total income.

(a) Yes, but only if her income is $11V^*$.

(b) Yes, but only if her income is $V^*/6$

(c) Yes, but only if her income is $5V^*$.

(d) Yes, but only if her income is $6V^*$.

(e) No.

3. Calculate the derivative of $5x^2 - 7x + 2\sqrt{x}$.

(a) $5x - 7 + 2x$

(b) $10x - 7x + 4\sqrt{x}$

(c) $10x - 7 + x^{-\frac{1}{2}}$

(d) $10x^3 - 14x + 6x^{3/2}$

(e) None of the above.

4. Let $p(q) = 10(q + 1)^{-2}$. What is the derivative dp/dq evaluated at $q = 0$?

(a) 10

(b) -10

(c) 0

(d) -20

(e) None of the above.

5. If X is on the horizontal axis and Y is on the vertical axis, find the slope at of the tangent line to the curve whose equation is $Y = 3 + 4X - 7X^2$ at the point where $X = 7$:

(a) 4

(b) -10

(c) 6

(d) 1/4

(e) -94

6. Find a local maximum of $f(x) = x^3 - 3x + 5$.

(a) $x = 0$

(b) $x = 1$

(c) $x = -1$

(d) Both (b) and (c).

(e) None of the above.

7. If for all $y > 0$, $\frac{d}{dy} f(y) = 1/y$, what is $\frac{d}{dy} f(2y^2 + 3)$ evaluated at the point $y = 1$.

(a) 0

(b) 1

(c) 4/5

(d) 3/4

(e) 2/9.

8. Evaluate
$$\int_0^4 (10 - x)dx.$$

(a) 32

(b) 28

(c) 24

(d) 2.5

(e) None of the above.