

## Applied Calculus; Quiz 0

1. Print your name. You must print it legibly. Also mention your year in school and your (probable) major.
2. Why are you taking this course ? Will you be taking other math or stat ? Why or why not ?
3. When, where and from whom did you last take a math course ?
4. Do you have math anxiety ? If so, what do you plan on doing about it ?
5. How many hours per week do you plan to put into this class ? What will you do if you start having difficulties with the material ?
6. What is Calculus and why do we study it ?
7. What grade do you honestly expect to get from this class ? Why ?

0. Print your name:

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1. Find the equation of the function that takes as input temperature in Fahrenheit ( $^{\circ}F$ ) and gives as output temperature in Celsius ( $^{\circ}C$ ). Use the fact that the relationship is linear, that  $0^{\circ}C = 32^{\circ}F$ , and  $100^{\circ}C = 212^{\circ}F$ . Give your equation in slope-intercept form

2. You decide to make Math T-shirts. You have fixed costs of \$200 and variable costs of \$6 per shirt. Find the cost equation. If you sell the shirts for ten dollars each, what is your break-even point ?

3. Let  $S(t)$  be the value in dollars of the stock of your favorite company *Math Co* where  $t$  is in days. Suppose that the stock has been climbing in value but the rate of increase has been decreasing. Sketch a possible graph of  $S(t)$ .

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1. You are selling magic instant math pills. If you charge one dollar, you end up making 700 sales every week. Each dime increase in price results in 30 fewer sales. Find the equation of the demand curve and graph it.

2. Your Caculus T-shirt business has fixed costs of \$500 and variable costs of \$8 per shirt. Assume that the demand curve has formula  $p = -(\frac{1}{10})n + 40$ . Find the optimal price.

3. Which function eventually gets larger  $y_1 = 1000x$  or  $y_2 = .001x^{1.1}$  ? Why ?

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1. The population of eliboM grows at an annual rate of 8.5%. If initially there were 200,000 inhabitants, how long before the population reaches one million ?

2. You have a sample of the radioactive element mathiscool. You observe that there are 90 grams at noon and 30 grams at 2pm. Find the half-life of mathiscool.

3. You want to give your newborn nephew one million dollars, in the form of mutual funds, on his 21st birthday. Assuming that the mutual funds return at a continuous rate of 14.5%, how much should you invest now ?

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1. How is the graph of  $y = f(x + 2) - 5$  gotten from that of  $y = f(x)$  ?

2. A polynomial  $f(x)$  has 2 local maximums (points that look like the top of a mountain). What is the least possible degree of  $f(x)$  ?

3. You win 3 million dollars in the lottery. You can receive the money in three equal annual payments, the first today, the second one year from today and the third two years from today. or a lump sum payment. Or you can get it a lump sum payment right now. Assuming a continuous annual return from investments of 7.5%, what would a fair lump sum payment be ?

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1. Sketch a graph of a function which has an inflection point but no local maximums or local minimums (no valley or mountain points).

2. Suppose the  $MR(63) = 41$  and  $MC(63) = 25$ . Approximately how does profit change if the production level is raised from 63 to 65 ?

3. Suppose the price of a stock rises faster and faster and then starts to level off. Let  $P(t)$  be the price of the stock as a function of time. What does that say about  $P'(t)$  and  $P''(t)$ .

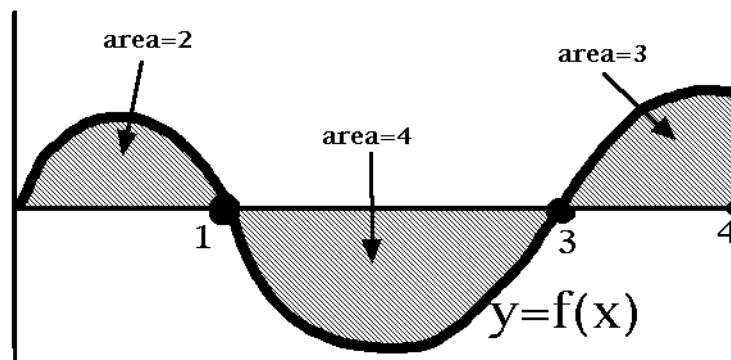
0. Print your name: \_\_\_\_\_

1. Sketch two graphs of  $y = x^3$  from  $x = 1$  to  $x = 2$ , with one showing how 3 rectangles underestimate the area, and the other showing how 3 rectangles overestimate the area (label which is which, as well as the coordinates of the points).

2. Suppose  $y = f(x)$  is symmetric about the origin – this means that  $f(-x) = -f(x)$ .

Explain why  $\int_{-7}^7 f(x) dx = 0$

3. Find  $\int_0^4 f(x) dx$ :



0. Print your name: \_\_\_\_\_

1. Find the derivative of  $f(x) = 12x^5 - 7\sqrt{x} + 4\pi^2 - 9\ln(x)$

2. Find the derivative of  $f(x) = e^x - x^e + \frac{1}{x^2}$

3. Find the equation of the tangent line to  $y = 2^x$  at  $x = 1$ . Sketch a single graph showing both functions.

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1. What is used to find the derivative of a function of the form  $f(g(x))$  ? (Hint: rhymes with “pain tool”.)

2. You get to math class late. On the blackboard you see the expression  $\frac{1}{2\sqrt{x^2 + 3}} \cdot (2x)$ .  
What method of taking derivatives was being discussed ?

3. What derivative rule might they discuss on the chain gang ?

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1. Sketch a the graph of a typical cost function and show graphically exactly what corresponds to average cost.

2. Sketch a single graoh showing two possible logistic models with carrying capacity of 2000, one with initial value of 100 and the other 3000.

3. Sketch the graph of a function  $f(x)$  that is defined and continuous for all  $x$ , has critical values only at  $(-3, -3)$ ,  $(0, 2)$  and  $(4, 6)$ , and where  $\lim_{x \rightarrow -\infty} f(x) = -\infty$  and  $\lim_{x \rightarrow +\infty} f(x) = 0$ .

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1. Find the average value without using a calculator of  $y = x^3$  over  $[0, 2]$ .

2. Find the antiderivative without using a calculator of  $f(x) = 2x^2 + \sqrt{x}$

3. Using the fundamental theorem of calculus and no calculator, find the signed area bounded by  $y = e + 3x$  from  $x = 1$  to  $x = 2$ .