

## Applied Calculus Exam 1

**Do the problems in order in your bluebook. Show your work.**

1. You are driving slowly to your favorite class – Math 120, of course – when you realize that you have forgotten your plate of brownies. You turn around and drive very fast back home, where you very quickly get the brownies. Then you hop in your car and start back towards school. But in your excitement over another Calculus class, you drive way too fast and get pulled over for speeding. But you manage to use Calculus to convince the policeman to refrain from giving you a ticket, though it does take you some time. Then you drive off slowly, but speed up again as soon as the cop is out of sight. Let  $f(t)$  be the distance you are from your favorite place in the world: your Calculus class, where  $t$  is time. (Note:  $f(t)$  is not the distance you have travelled.) Sketch a graph of  $f(t)$ . Label the various sections of the graph.
2. You want to give your newborn niece two million dollars, in the form of mutual funds, on her 21th birthday. Assuming that the mutual funds return at a continuous rate of 9.35%, how much should you invest now ?
3. To make money for your next Calculus party, you decide to sell iced cappuccino's during lunchtime. If you charge one dollar, you end up making 900 sales every week. Each quarter increase in price results in 30 fewer sales. Find the equation of the demand curve and graph it, where the input variable is price measured in dollars.
4. The depth of water in a tank oscillates once every  $\pi$  hours. The smallest depth is 3.6 feet and the largest is 7.6 feet. Using a sine function of the form  $y = A \cdot \sin(B \cdot x) + C$  to find a formula for the depth as a function of time.
5. The population of WeLoveMath grows at an annual rate of 7.5%. If initially there were 140,000 inhabitants, how long before the population reaches a half of a million ?
6. You have a budget for textbooks and social events of \$1600. Textbooks cost \$100 each. A night out costs \$80. Find and graph the equation of your budget constraint. Shade the region that corresponds to you living within your means.
7. How is the graph of  $y = 4 + (3 \cdot f(x - 5))$  gotten from that of  $y = f(x)$  ?
8. A polynomial  $f(x)$  has 2 local maximums (points that look like the top of a mountain). What is the least possible degree of  $f(x)$  ? Why ?