

NAME: \_\_\_\_\_

*Answer all problems on this page.*

1. (4 points) Records indicate that  $x$  years after 2005, the average tax on a product is equal to  $T(x) = 20x^2 + 40x + 600$  dollars.
  - (a) (2 points) At what rate was the tax increasing with respect to time in 2005?
  - (b) (2 points) By how much did the tax change between the years 2005 and 2009?
  
2. (6 points) An environmental study of an urban environment suggests that  $t$  years from now, the average level of carbon dioxide in the air will be  $Q(t) = 0.15t^2 + 0.1t + 3.4$  parts per million.
  - (a) (2 points) At what rate will the carbon dioxide level be changing with respect to time 1 year from now?
  - (b) (2 points) By how much will the carbon dioxide level change this year?
  - (c) (2 points) By how much will the carbon dioxide level change over the next 2 years?
  
3. (5 points) The population density at the centre of a city is 44,000 inhabitants. It then drops to 11,000 at a distance of 9 miles from the centre.  
Express population as a function of the form  $D(x) = Ae^{kx}$  where  $x$  is the distance in miles from the centre. *Note:* you do not need to compute  $k$  precisely.
  
4. (5 points) A country experiences a GDP decay equal to  $G(t) = -3t^2 + 20t + 1800$  billion dollars in 2000.
  - (a) (2.5 points) What is its GDP decay rate in 2020?
  - (b) (2.5 points) What is the relative decay rate of GDP in that same year?