Calculus End of Year Review **Name:______________________**

Section 2 Part A (calculator):

1. The slope of a function at any point (x, y) is $\frac{e^x}{e^x+1}$. The point $(0, 2\ln 2)$ is on the graph of f.

(a) Write an equation of the tangent line to the graph of f at $x = 0$.

(b) Use the tangent line in part (a) to approximate $f(0.1)$ to the nearest thousandth.

(c) Solve the differential equation $\frac{dy}{dx} = \frac{e^x}{e^x+1}$ with the initial condition $f(0) = 2\ln 2$.

(d) Use the solution in part (c) and find $f(0.1)$ to the nearest thousandth.

2. The temperature in a greenhouse from 7:00 p.m. to 7:00 a.m. is given by $f(t) = 96 - 20\sin\left(\frac{t}{4}\right)$, where $f(t)$ is measured in Fahrenheit and t is measured in hours.

(a) What is the temperature of the greenhouse at 1:00 a.m. to the nearest degree Fahrenheit?

(b) Find the average temperature between 7:00 p.m. and 7:00 a.m. to the nearest tenth of a degree Fahrenheit.

(c) When the temperature of the greenhouse drops below $80°F$, a heating system will automatically be turned on to maintain the temperature at a minimum of $80°F$. At what value of t to the nearest tenth is the heating system turned on?

(d) The cost of heating the greenhouse is $0.25 per hour for each degree. What is the total cost to the nearest dollar to heat the greenhouse from 7:00 p.m. and 7:00 a.m.?

3. A particle is moving along a straight line. The velocity of the particle for $0 \le t \le 30$ is shown in the table below for selected values of t.

t (sec)	0	3	6	9	12	15	18	21	24	27	30
$v(t)$ (m/sec)	0	7.5	10.1	12	13	13.5	14.1	14	13.9	13	12.2

(a) Using the midpoints of five subintervals of equal length, find the approximate value of $\int_0^{30} v(t)\,dt$.

(b) Using the result in part (a), find the average velocity over the interval $0 \le t \le 30$.

(c) Find the average acceleration over the interval $0 \le t \le 30$.

(d) Find the approximate acceleration at $t = 6$.

(e) During what intervals of time is the acceleration negative?

Section 2 Part B (no calculator):

4. See figure 1T-13.

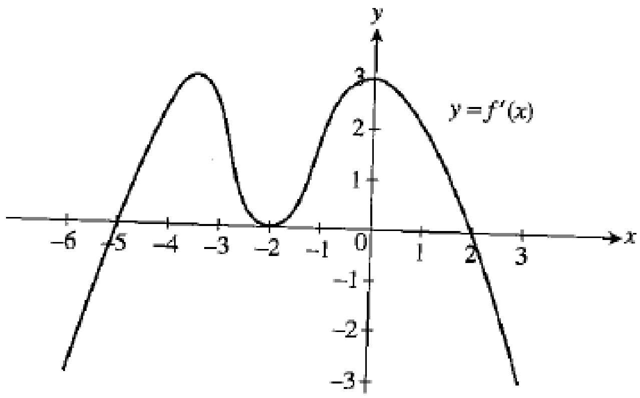

Figure 1T-13

The graph of f', the derivative of a function f, for $-6 \le x \le 3$ is shown in Figure 1T-13.

(a) At what value(s) of x does f have a relative maximum value? Justify your answer.

(b) At what value(s) of x does f have a relative minimum value? Justify your answer.

(c). At what value(s) of x does the function have a point of inflection? Justify your answer.

(d) If $f(-5) = 2$, draw a possible sketch of f on $-6 \le x \le 3$.

5. Given the equation $y^2 - x + 2y - 3 = 0$:

(a) Find $\frac{dy}{dx}$.

(b) Write an equation of the line tangent to the graph of the equation at the point $(0,-3)$.

(c) Write an equation of the line normal to the graph of the equation at the point $(0,-3)$.

(d) The line $y = \frac{1}{4}x + 3$ is tangent to the graph at point P. Find the coordinates of point P.

6. Let R R be the region enclosed by the graph of $y = x^2$ and the line $y = 4$.

(a) Find the area of region R.

(b) If the line $x = a$ divides region R into two regions of equal area, find a.

(c) If the line $y = b$ divides the region R into two regions of equal area, find b.

(d) If region R is revolved about the x-axis, find the volume of the resulting solid.