HONOR 2201, CALCULUS FOR NON-SCIENCE MAJORS, QUIZ 6, 10/28/05

Name : Solution Student ID # : _____

1.(5 pts) Find the average value of the function $f(x) = 4 + 2x$ over $[0, 2]$.

sol. The average value of $f = \frac{1}{2-0}\int_0^2 4 + 2x dx$

$$= \left[\frac{1}{2}(4x + x^2)\right]_0^2$$
$$= \frac{1}{2}\left[(4 \cdot 2 + 2^2) - (4 \cdot 0 + 0^2)\right]$$
$$= \boxed{6}.$$

2. (4 pts) Find the indefinite integral, $\int 1 + \sin(2t)dt$.

sol. Recall that $\int k dt = kt + C$ and $\int \sin(kt) = -\frac{1}{k}\cos(kt) + C$. So the answer is

$$\int 1 + \sin(2t)dt = \boxed{t - \frac{1}{2}\cos(2t) + C}.$$

3.(6 pts) Find the present value of an income stream of \$10 per year for a period of 20 years if the compounded continuously interest rate is 10%.

sol. Note that $M = 20, S(t) = \$10, r = 0.1$. So

Present Value $= \int_0^M S(t)e^{-rt}dt$

$$= \int_0^{20} 10e^{-(0.1)t}dt$$
$$= \left[\left(10 \cdot \frac{e^{-(0.1)t}}{-0.1}\right)\right]_0^{20}$$
$$= \left[\left(10 \cdot \frac{e^{-(0.1)20}}{-0.1}\right) - \left(10 \cdot \frac{e^{-(0.1)0}}{-0.1}\right)\right]$$
$$= \left[(-100 \cdot e^{-2}) - (-100 \cdot e^0)\right]$$
$$= \boxed{-100 \cdot e^{-2} + 100}$$
$$(\approx \boxed{\$\ 86.47})$$