EMT 121

Practice Exam I

March 22, 2010

1. Find all antderivatives of $f(x) = x^2(2x+1)$.

2. Suppose that f is a function satisfying $f"(x) = 4$, $f(0) = 2$ and $f(1) = 5$. Find f.

3. Evaluate.

   (a) $\int_1^4 4\sqrt{x}\,dx$

   (b) $\int (x + \frac{1}{x})^2\,dx$

   (c) $\int \frac{x^2+2x}{x}\,dx$

   (d) $\int (x-1)(6x-5)\,dx$

   (e) $\int \frac{\sin(6x-1)}{3}\,dx$

   (f) $\int \frac{dx}{3-2x}$

   (g) $\int \frac{dx}{\sqrt{5x-1}}$

4. Find the value of $u > 0$ if $\int_u^{2u} \frac{1}{x^4}\,dx = \frac{7}{192}$.

5. Consider the region R, in the first quadrant, bounded above by $y = 2x$ and below by $y = x^2$.

   (a) Find the area of R.

   (b) Find the volume of the solid that is obtained by rotating R about the y-axis.

6. Find the volume of the solid formed by revolving the region bounded by the graph of $f(x) = -x^2 + x$ and the x-axis about the x-axis.

7. Find the area enclosed between the x-axis and the curve $y = e^x$ between $x = 1$ and $x = 2$, giving your answer in terms of e.

8. Find the area bounded by the curves $y = x^2 + 4x$ and $y = x - 2$.

9. For some choice of $f(x)$, a and b , the quantity

$$\lim_{n\to\infty}\sum_{i=1}^{n}((1+\frac{i}{n})^2+1)\cdot\frac{1}{n}$$

is equal to $\int_a^b f(x)\,dx$. Find a suitable such $f(x)$, a and b.

10. (a) Express $\frac{5}{(3+x)(2-x)}$ in the form $\frac{P}{3+x}+\frac{Q}{2-x}$, where P and Q are constants.

    (b) Hence, find $\int \frac{5}{(3+x)(2-x)}\,dx$.