Practice problems for Exam 3

1.Find the following indefinite integrals

(A) $\int \frac{\sqrt{x}+2}{x}\,dx$

(B) $\int \frac{2t+2}{(3t^2+6t)^4}\,dt$

(C) $\int 4x^2 e^{x^3}\,dx$

(D) $\int 2\sqrt{3x+4}\,dx$

2. Use the Fundamental theorem of calculus to find the following integrals:

(A) $\int_{-1}^{2} x\sqrt{25-x^2}\,dx$

(B) $\displaystyle\int_0^1 \frac{e^{4x}}{(2+e^{4x})^2}\,dx$

3. Find the area of the region bounded by $f(x) = e^{2x}$, $g(x) = 8 - e^{2x}$, and the line $x = -1$.

4. Consider the region below $f(x) = 6 - x$, above the x-axis and between $x = 1$ and $x = 3$.

(A) Use the Trapezoidal rule to approximate the area of the region using 4 rectangles.

(B) 1. Use the left endpoint on each interval of length 0.5 (Left sum) to approximate $\int_0^2 f(x)\,dx$ where the values of $f(x)$ are given in the table below for $x = 0, 0.5, 1, 1.5$.

x	0	0.5	1	1.5	2
$f(x)$	1	3	8	12	17

(B) 1. Use the right endpoint on each interval of length 0.5 (Right sum) to approximate $\int_0^2 f(x)\,dx$ where the values of $f(x)$ are given in the table above for $x = 0, 0.5, 1, 1.5$.

5. Find the consumers' surplus if the demand function for grass seed is given by

$$D(q) = \frac{200}{(3q+1)^2},$$

assuming supply and demand are in equilibrium at $q = 3$.

6. If money is flowing continuously at a constant rate of \$2000 per year over 7 years at 5% interest compounded continuosly, find the following.

(A) The total money flow over the 7 year period.

(B) The accumulated amount of money flow, compounded continuously, at time $T = 7$

(C) The present value of the amount with interest.

7. Suppose the supply function for oil is given (in dollars) by

$$S(q) = 0.5q,$$

and the demand function is given by

$$D(q) = \frac{1000}{q+1}.$$

(A) Find the point at which supply and demand are in equilibrium.

(B) Find the producer's surplus.

8. Find the cost function for the following marginal cost function,

$$C'(x) = 0.5x^2 + 3x$$

where fixed cost is \$5.

9. The marginal profit in dollars on Brie cheese sold at a cheese store is given by

$$P'(x) = x(50x^2 + 30x),$$

where x is the amount of cheese sold, in hundreds of pounds. The "profit" is $-\$40$ when no cheese is sold.

(A) Find the profit function.

(B) Find the profit from selling 200 Ib of Brie cheese.

10. Suppose a factory has installed a new process that will produce an increased rate of revenue (in thousand of dollars per year) of

$$R'(t) = 100 - 0.5e^{0.5t},$$

where t is time measured in years. The new process produces additional costs (in thousands of dollars per year) at the rate of

$$C'(t) = 0.4e^{0.5t}.$$

Find the net total savings.

11. Suppose the rate of profit (in thousands of dollars) after t years is given by

$$P'(t) = (5t + 5)(t^2 + 2t + 1)^{1/3}.$$

Find the total profit in the first two years.