MAT 251 – Exam 3 Review

1) Integrate $\int (5x^7 + \frac{3}{x^5} + e^{4x})dx$ 2) Integrate $\int (\sin(4x) - \frac{1}{9x} + \sqrt[3]{x^2})dx$

3) Integrate $\int (\frac{5}{\sqrt{x}} - \csc^2\left(\frac{x}{4}\right) + \sec(3x)\tan(3x))dx$

4) If $f'(x) = 4x^2 - 3$ and $f(2) = 9$, then find $f(5)$

5) $\int \sin(7x)\, dx$ 6) $\int \csc^2\left(\frac{x}{5}\right) dx$ 7) $\int \frac{2}{x}\, dx$ 8) $\int 15\sec^2(5x)\, dx$

9) $\int \csc(4x)\cot(4x)\, dx$ 10) $\int 6\cos(6x)\, dx$ 11) $\int dx$ 12) $\int 16e^{4x}\, dx$

13) The population of a small town is increasing at a rate of $P'(t) = 26e^{.024t}$ where P is the population and t is the number of years after the beginning of 1995. The population at the beginning of 1995 was 5800. Estimate the population at the beginning of 2016. Round to the nearest person.

14) Use Riemann sums to approximate $\int_1^7 \sqrt{2e^x + 5}\, dx$ using n = 4 subintervals. Round your final answer to 4 decimal places. A) Using the Left Endpoint Method B) Using the Right Endpoint Method C) Using the Midpoint Method.

Evaluate the following. Assume that a, b, c, and m are positive constants.

15) $\int_1^3 (5x^2 + 2x)dx$ 16) $\int_1^e \frac{4}{x}dx$ 17) $\int_0^5 (x-5)^2 dx$ 18) $\int_1^a (mx+b)dx$

19) $\int_0^{\frac{\pi}{4}} \sec^2 x\, dx$ 20) $\int_1^5 \frac{3}{\sqrt{x}}dx$ 21) $\int_0^2 e^{4x}dx$ 22) $\int_1^2 (3x^2+2)dx$

23) The acceleration of an object (in m/sec^2) after t seconds is given by A(t) = $t^2 - 4t + 2$. The initial velocity is 10 meters per second. The position after 2 seconds is 300 meters.
A) Find the velocity and position functions. B) Find the acceleration, velocity and position after exactly 4 seconds.

24) Find the area of the region bounded by $f(x) = 4x - x^2$ and $g(x) = x^2 - 6x + 8$

25) Find the area of the region bounded by $f(x) = x^3$, $g(x) = 10 - x$, and $x = -1$

26) Find the area bounded by the curves $y = x^3 + 2x^2 - 10x + 7$ and $y = 2x^2 - x + 7$

27) Find the average value of the function $f(x) = 6x^2 + 8x - 9$ from x = 1 to x = 5.

28) The population of a small town is increasing at a rate of $P(t) = 8000e^{.03t}$ where P is the population and t is the number of years after the beginning of 1995. Find the average population from the beginning of 1998 to the beginning of 2005. Round to the nearest person.

Integrate the following. Assume that a and b are positive.

29) $\int x\cos(3x^2+5)dx$ 30) $\int x\cos(3x)dx$ 31) $\int \frac{(\ln x)^3}{x}dx$ 32) $\int ax(bx^2+2)dx$

33) $\int \sec^2 x\tan^2 x\,dx$ 34) $\int x^3 \ln x\,dx$ 35) $\int x\sec^2 x\,dx$ 36) $\int \frac{12\sec^2(3x)}{1-\tan(3x)}dx$

Solutions

1) $\frac{5}{8}x^8-\frac{3}{4x^4}+\frac{e^{4x}}{4}+C$ 2) $-\frac{1}{4}\cos(4x)-\frac{1}{9}\ln|x|+\frac{3}{5}x^{5/3}+C$ 3) $10\sqrt{x}+4\cot\left(\frac{x}{4}\right)+\frac{1}{3}\sec(3x)+C$

4) 156 5) $-\frac{1}{7}\cos(7x)+C$ 6) $-5\cot\left(\frac{x}{5}\right)+C$ 7) $2\ln|x|+C$ 8) 3tan(5x) + C

9) $-\frac{1}{4}\csc(4x)+C$ 10) sin(6x) + C 11) x + C 12) $4e^{4x}+C$ 13) 6510

14A) 62.3558 B) 127.8384 C) 88.8268 15) $\frac{154}{3}$ 16) 4 17) $\frac{125}{3}$

18) $\frac{a^2m}{2}+ab-\frac{m}{2}-b$ 19) 1 20) $6\sqrt{5}-6$ 21) $\frac{e^8-1}{4}$ 22) 9

23A) $v(t)=\frac{1}{3}t^3-2t^2+2t+10$, $s(t)=\frac{1}{12}t^4-\frac{2}{3}t^3+t^2+10t+280$

B) Position $\frac{944}{3}m$, velocity $\frac{22}{3}\frac{m}{\sec}$, acceleration $2\frac{m}{\sec^2}$ 24) 9 25) $\frac{99}{4}$ 26) $\frac{81}{2}$

27) 77 28) 9740 29) $\frac{1}{6}\sin(3x^2+5)+C$ 30) $\frac{1}{3}x\sin(3x)+\frac{1}{9}\cos(3x)+C$

31) $\frac{1}{4}[\ln(x)]^4+C$ 32) $\frac{ab}{4}x^4+ax^2+C$ 33) $\frac{1}{3}\tan^3 x+C$

34) $\frac{1}{4}x^4\ln x-\frac{1}{16}x^4+C$ 35) $x\tan x+\ln|\cos x|+C$ 36) $-4\ln|1-\tan(3x)|+C$