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MAM1020S **Tutorial 12** **August 2017**

1. Find the area in the first quadrant bounded by $f(x) = 4x - x^2$ and the x-axis.
2. Find the area bounded by the following curves: $y = x^2 - 4,\ y = 0, x = 4$.
3. Compute the following definite integrals
   (a) $\int_0^1 x(x^2+2)^3 dx$
   (b) $\int_0^1 xe^x dx$
   (c) $\int_0^2 \sqrt{4-x} dx$
4. Find the geometric area of the following functions on the corresponding interval.
   (a) $f(x) = 6 - x^2$ on $[0.2]$
   (b) $f(x) = 3x^2 - 3$ on $[0, 3]$
   (c) $f(x) = 9x^2 - 36$ on $[0, 4]$
5. Compute the following integrals using integration by parts.
   (a) $\int \frac{ln(x)}{x} dx$
   (b) $\int x^2 e^x dx$ (You will have to do the process twice in this example.)
   (c) $\int xe^{ax} dx$ for a real number a.
   (d) $\int ln(x)^2 dx$
6. Find the (geometric) area between the following curves above the x-axis and the x-axis
   (a) $f(x) = 27 - 3x^2$
   (b) $f(x) = 12 - 3/4x^2$
   (c) $f(x) = -2x - x^2/2$
7. Compute the following indefinite integrals
   (a) $\int \sqrt{x} dx$
   (b) $\int 3e^x dx$
   (c) $\int (3x^2 - \sqrt{5x} + 2) dx$
   (d) $\int (\frac{1}{2x} - \frac{2}{x^2} + \frac{3}{\sqrt{x}}) dx$
   (e) $\int (2e^x + \frac{6}{x} + ln(2)) dx$.
   (f) $\int \frac{x^2+3x-2}{\sqrt{x}} dx$
   (g) $\int (x^3 - 2x^2)(\frac{1}{x} - 5) dx$
8. Find the function f whose tangent has slope $x^3 - \frac{2}{x^2} + 2$ for each value of x and whose graph passes through the point $(1, 3)$.
9. It is estimated that t years from now the population of a certain lakeside community will be changing at the rate of $0.6t^2 + 0.2t + 0.5$ thousand people per year. Environmentalists have found that the level of pollution in the lake increases at the rate of approximately 5 units per 1000 people. By how much will the pollution in the lake increase during the next 2 years?
10. An object is moving so that its speed after t minutes is $v(t) = 1 + 4t + 3t^2$ meters per minute. How far does the object travel during $3rd$ minute?
11. Compute the integral
    1. $\int \frac{s^2+1}{s^2-1} ds$
    2. $\int_4^0 x\sqrt{1+2x} dx$
    3. $\int sin^2(x) cos^2(x) dx$
    4. $\int sin(\sqrt{w}) dw$

5. $\int \frac{ln(x)}{x} dx$
6. $\int sin(t)cos(2t)dt$
7. $\int \frac{x+1}{4+x^2} dx$
8. $\int \frac{sin(tan(\theta))}{cos^2(\theta)} d\theta$
9. $\int x\sqrt{3-2x-x^2}dx$
10. $\int_0^{\pi/3} sin^3(z)cos(z)dz$
11. $\int \frac{1}{3x^2+2x+1} dx$
12. $\int \frac{1}{e^t+1} dt$
13. $\int e^{3a}cos(3a)da$
14. $\int \frac{x^2}{1+x^6} dx$
15. $\int \frac{1}{t(ln(t))^2} dt$
16. $\int \frac{xe^{2x}}{(2x+1)^2} dx$
17. $\int (tan(x)+cot(x))^2 dx$
18. $\int te^{t^2} sin(t^2)dt$
19. $\int \frac{2p-4}{p^2-p} dp$
20. $\int_3^4 \frac{1}{(3x-7)^2} dx$
21. $\int \frac{t^3}{(2-t^2)^{5/2}} dt$
22. $\int \frac{1}{x^2\sqrt{4-x^2}} dx$
23. $\int \sqrt{y^2-1}dy$
24. $\int xsin(x)cos(x)dx$
25. $\int (1+cos(\theta))^2 d\theta$
26. $\int \frac{1}{\sqrt{4x-x^2}} dx$
27. $\int_0^1 \frac{1}{1+x^{1/3}} dx$
28. $\int \frac{1}{x^3+x} dx$
29. $\int ln(1+t)dt$
30. $\int sin(3x)cos(5x)dx$
31. $\int \frac{1}{k^2-6k+9} dk$
32. $\int \frac{1}{sec(x)-1} dx$
33. $\int_0^1 \frac{2}{e^{-x}+1} dx$
34. $\int \frac{1}{c^2-6x+10} dc$
35. $\int f(x)f'(x)dx$
36. $\int \frac{1}{x^2+4x+5} dx$
37. $\int_0^2 \frac{1}{(3+5x)^2} dx$
38. $\int sin(ln(u))du$
39. $\int r(ln(r))^2 dr$
40. $\int \frac{1}{x^3-x} dx$
41. $\int sec^3(u)du$
42. $\int \frac{\sqrt{x^2-2x-8}}{x-1} dx$
43. $\int \frac{\sqrt{r^2-1}}{r} dr$
44. $\int (e^{t^2}+16)te^{t^2} dt$
45. $\int \sqrt{y}ln(y)dy$
46. $\int \frac{cos(\theta)}{1+sin^2(\theta)} d\theta$
47. $\int \frac{1}{x^2\sqrt{x^2+4}} dx$
48. $\int te^{t^2} dt$
49. $\int cos(\pi t)cos(sin(\pi t))dt$
50. $\int_0^{\pi/4} sin^5(x)dx$