**BAE Math 2 Exercises**

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**Exercise 1.** Study the following functions and sketch a graph of them

$a)\ y = f(x) = xe^{\frac{1}{x}}$

$b)\ y = f(x) = \dfrac{\ln(x)}{\ln(x) - 1}$

**Exercise 2.** Compute the following indefinite integrals

$(a) \int \dfrac{e^{\sqrt{x}}}{\sqrt{x}} dx$

$(b) \int \sin(x)\cos(x) dx$

$(c) \int \dfrac{x^3 + 2x^2 + 3}{\sqrt{x}} dx$

$(d) \int x^2 \sin(x^3) dx$

$(e) \int \tan(x) dx$

$(f) \int \dfrac{x}{\cos^2(x^2)} dx$

$(g) \int \dfrac{e^x}{1 + e^{2x}} dx$

$(h) \int \dfrac{\sin(\sqrt{x})\cos(\sqrt{x})}{\sqrt{x}} dx$

$(i) \int \dfrac{\cos(\log(x))}{x} dx$

**Exercise 3.**
Compute the following integrals by substitution:

$(a)$ $\displaystyle\int \frac{1}{\sqrt{4-x}}dx$

$(b)$ $\displaystyle\int \frac{e^x}{\sqrt{e^x+1}}dx$

$(c)$ $\displaystyle\int \frac{e^x}{\sqrt{e^x+1}}dx$

$(d)$ $\displaystyle\int \frac{1}{x\log(x)}dx$

$(e)$ $\displaystyle\int \frac{\log^3(x)+3\log(x)-\sqrt{2}}{x}dx$

$(f)$ $\displaystyle\int \frac{\sin(2+\sqrt{x})}{3\sqrt{x}}dx$

$(g)$ $\displaystyle\int \sin^7(x)\cos(x)dx$

$(h)$ $\displaystyle\int \frac{e^x\tan(e^x)}{\cos^2(e^x)}dx$

$(i)$ $\displaystyle\int \sin(2x)(1+cos^2(x))dx$

$(j)$ $\displaystyle\int \frac{\sin(x)}{2+\cos(x)}dx$

$(k)$ $\displaystyle\int \frac{x}{1+x^4}dx$

**Exercise 4.**
Compute the following integrals by parts:

$(a)$ $\displaystyle\int xe^{-2x}dx$

$(b)$ $\displaystyle\int (x^2-x+1)e^{-x}dx$

$(c)$ $\displaystyle\int (x+2)\log(x)dx$

$(d)$ $\displaystyle\int \log(x)dx$

$(e)$ $\displaystyle\int (2x+5)\cos(x)dx$

$(f)$ $\displaystyle\int \arctan(x)dx$

$(g)$ $\displaystyle\int x^2\arcsin(x)dx$

$(h)$ $\displaystyle\int \arcsin(x)dx$

$(i)$ $\displaystyle\int e^x\sin(x)dx$

$(j)$ $\displaystyle\int \sin^2(x)dx$