## Differentiation

1. Differentiate the following:
a) $f(x)=x\left(x^{2}+2 x\right)$
b) $y=\frac{x^{5}-1}{x^{2}}$
c) $f(x)=\frac{x^{2}-3}{x^{4}}$
d) $y=3 x_{3}^{2}-\frac{5}{x_{2}^{3}}$
2. Find the rate of change for the function, $f(x)=2 x^{3}+x^{2}-\frac{3}{2} x+4$, when $x=2$.
3. Find the equation of the tangent to the curve $y=x^{3}-2 x^{2}+4$ at the point where $x=2$.
4. Find the equation of the tangent to $y=x^{2}+3 x+2$ parallel to the line $y=2 x+1$.
5. Find the stationary point(s) of the curve $y=8 x^{3}-4 x^{2}+6$ and determine their nature.
6. An open tank is to be designed in the shape of a cuboid with a square base, the total surface area of the base and four walls together being $100 \mathrm{~m}^{2}$.
a) If the length of the base is $x \mathrm{~cm}$, show that the volume,

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V(x) \text { is given by } V(x)=\frac{x}{4}\left(100-x^{2}\right)
$$

b) Find the length of the base that makes the volume of the tank a maximum.

