

1. Differentiate the following.

a.  $F(r) = \frac{5}{r^3}$

b.  $y = 3e^x + \frac{4}{\sqrt[3]{x}}$

c.  $G(q) = (1 + q^{-1})^2$

d.  $g(x) = (x + 5\sqrt{x})e^x$

e.  $y = \frac{\sqrt{x}}{2 + x}$

f.  $f(x) = \frac{ax + b}{cx + d}$

2. Find the first and second derivatives of the function.

$$G(r) = \sqrt{r} - \sqrt[3]{r}$$

3. Find an equation of the tangent line to the graph of  $y = x^2 + 2e^x$  at  $(0, 2)$ .
4. The equation of motion of a particle is  $s = t^4 - 2t^3 + t^2 - t$ , where  $s$  is in meters and  $t$  is in seconds.
- (a) Find the velocity and acceleration as functions of  $t$ .
- (b) Find the acceleration at time 1 s.
5. A quantity  $p$  of fabric, measured in yards, is sold at a price  $f(p)$  (dollars) which depends on the quantity. The total revenue from a sale of  $p$  yards of fabric is  $R(p) = pf(p)$ .
- (a) What does it mean to say that  $f(20) = 100$  and that  $f'(20) = -0.5$ ?
- (b) Assuming the values in part (a), find  $R'(20)$  and interpret your answer.