1. Gravel is being dumped from a conveyor belt at a rate of 30 ft^3/min and its coarseness is such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?

2. Find $\frac{dy}{dx}$ if $y\cos\left(\frac{1}{y}\right) = 5 - 2xy$

3. A child flies a kite at a height of 300 ft, the wind carrying the kite horizontally away from them at a rate of 25 ft/sec. How fast must they let out the string when the kite is 500 ft away from them horizontally.

4. (i) Find the critical points of the following functions and then (ii) determine the local minimum and maximum values and where they occur.

   (a) $f(x) = x^{2/3} - 3x$

   (b) $f(x) = \frac{1}{\sqrt{3x^2-1}}$

   (c) $f(x) = x^3 - 24$

5. Find antiderivatives of the following functions

   (a) $f(x) = 5x^3 - 2x_4^{-3}$

   (b) $f(x) = \cos(x) + 3\sin(x)$

   (c) $f(x) = \frac{1}{\sqrt[4]{x}}$

6. Find the absolute minimum and absolute maximum values of $f(x)$ on the given interval

   (a) $f(x) = -\frac{2}{x^2+4}$ on $[0, 5]$

   (b) $f(x) = -x^3 - 6x^2 - 9x + 3$ on $[-3, -1]$

7. A particle moves along an axis modeled by the position function $s(t) = t^3 - 7t^2 + 16t - 10$, where s is inches, and t is time in seconds. .

   (a) When is the particle moving forwards? When is it moving backwards?

   (b) What is the position of the particle when it has velocity of 8 ft/sec?

8. Consider the function $k(t) = \frac{4}{\sqrt{t}}$. ($i$) Find dy and (ii)evaluate dy when $dx = 0.01$ and $x = 0$. (iii)Compare dy to Δy

9. Evaluate the following limits.

   (a) $\lim_{x\to\infty} \frac{4x^2-3x}{2x-1}$

   (b) $\lim_{x\to\infty} \frac{2x+5}{\sqrt{8x^2-5x+1}}$

10. Find the vertical and horizontal asymptotes of the following function.

$$f(x) = \frac{4x+1}{x^2 - 3x + 2}$$

11. Sketch the graph of the curve $y = \frac{x^3}{x^3+1}$

12. (i)Explain how we know that the given equation must have a root in the interval $[0, 1]$. Then, (ii) use Newtons method to approximate the root (you only need to find x_2 for a reasonable guess for x_1..

$$x^4 - 12x^3 + 6 = 0$$