

(c) the gradient at the  $y$ -intercept of the graph of  $f$

Determine the  $(x, y)$  coordinates of the lowest point on the graph of

$$y = -f\left(\frac{1}{4}x + 3\right) + 7.$$

(6 marks)

11. For a particular function in the  $xy$ -plane, the domain is  $(-\infty, 9)$  and


$$\frac{dy}{dx} = (x - 5.5)^2(x^2 - 21x + 8)(9 - x).$$

(a) Find the  $x$ -coordinate of each stationary point.

(b) Determine the nature of each stationary point by using the First Derivative Test or the Second Derivative Test.

top surface is decreasing when the height of the partially-made cone is 11 centimeters. Present your final answer in a sentence and accurate to one decimal place.

(6 marks)

A diagram showing a large cone with a smaller, inverted cone inside it. The smaller cone is shaded blue and represents the partially-made cone. The larger, unshaded cone represents the remaining material. The top surface of the smaller cone is the top surface of the partially-made cone.

(b) There is one function:  $y = g(x)$  for which

- the domain is  $[0, \infty)$
- the graph has an  $x$ -intercept at 3
- $g'(x) = \frac{1}{10}x^2 + \frac{1}{4x^2}$ .

Use your answer to part (a) to find the value of  $g(6)$ .

17. (OCTOBER PT)  
If  $f$  is the function with domain  $(-\infty, 0]$  for which

$$f(x) = \frac{13}{x-3} + \frac{1}{4x^2},$$

find all possible values of  $x$  for which  $f(x) = -3$ .