

DUAL PROGRAM  
Physics (Pre-stage Level)

**Assignment III (Due: 2 pm, 13 Jan 2018)**

*Limits and Derivatives*

1. Evaluate (a)  $\lim_{x \rightarrow \infty} \frac{x+3}{x-2}$ , (b)  $\lim_{x \rightarrow -\infty} \frac{x^2+x-1}{2x^3+4}$ . [10 marks]
  2. Evaluate  $\lim_{x \rightarrow \infty} (\sqrt{x} - \sqrt{x+1})$ . [10 marks]
  3. (a) Find the slope of the tangent to the curve  $y = x^2$  at any point  $(x, y)$ . (b) Hence find the slope of the curve  $y = x^2$  at  $(1, 1)$ . [10 marks]
  4. Find the derivative of  $y = x^3$  with respect to  $x$  from first principles. [10 marks]
  5. Let  $f(x) = \sqrt{3x}$ . Find the derivative of  $f(x)$  with respect to  $x$  from first principles and hence find the slope of  $f(x)$  at  $x = 3$ . [10 marks]
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*Differentiation Rules*

6. Differentiate  $y = \left(\frac{1+x}{1+x^2}\right)^3$  with respect to  $x$ . [10 marks]
7. Given that  $x = 2t^2$  and  $y = 3 + 5t$ , find  $\left.\frac{dy}{dx}\right|_{t=3}$ . [10 marks]
8. If  $x = \frac{y}{1+y}$ , find  $\frac{dy}{dx}$ . [10 marks]
9. Given  $\frac{x^2y+1}{3xy^2-1} = 1$ , find  $\frac{dy}{dx}$  and the values of  $\left.\frac{dy}{dx}\right|_{x=2}$ . [20 marks]
10. Find  $\frac{d^2y}{dx^2}$  if  $x^4 + y^4 = 1$ . [20 marks]

 The End 