

Name: \_\_\_\_\_

1. [5 marks] Let  $f(x) = (x^3 + x + 1)\tan^{-1}(2x - 1) + \pi \sin^{-1} x$ . Find  $f'(0)$ .

2. [4 marks] a) Use differentials to estimate the change in  $y = \sin x$  as  $x$  changes from  $\frac{\pi}{3}$  to  $\frac{17\pi}{48}$ . Round your answer to four decimal places.

b) Use your calculator to find the true change,  $\Delta y$ , to four decimal places.

3. [4 marks] Find  $f'(x)$  for  $f(x) = \log_3[(x^7 + 5x^6)^8(x^2 + 9)]$ . Simplify your answer.

4. [4 marks] Find  $f'(y)$  for  $\frac{e^{4y^2} - e^{-4y^2}}{e^{2y}}$ . Simplify your answer.

5. [10 marks] Integrate:

a)  $\int (v^{11} + \frac{1}{v^{10}} + \frac{1}{\sqrt[3]{v}}) dv$

b)  $\int (\frac{5\sqrt{x}-6x^2}{x^6}) dx$

c)  $\int t(t-2)^{98} dt$

6. [3 marks] Find  $f(x)$  if  $f''(x) = x^3 + 5x + 1$ ,  $f(0) = 6$  and  $f(1) = -1$ .