

## Math 10a Midterm 2 Version B

$$1) a) \quad y' = (\ln 25) 25^x + 25x^{24}$$

$$b) \quad \left(\frac{1}{x^4} - \frac{3}{x^8}\right) 2^x = (x^{-4} - 3x^{-8}) 2^x$$

So the derivative is:

$$(-4x^{-5} + 24x^{-9}) 2^x + \ln 2 (x^{-4} - 3x^{-8}) 2^x$$

$$c) \quad y' = \left(e^{\sqrt{2x^5+10}}\right) \cdot \left(\frac{1}{2} (2x^5+10)^{-\frac{1}{2}}\right) \cdot (10x^4)$$
$$= \frac{5x^4 e^{\sqrt{2x^5+10}}}{\sqrt{2x^5+10}}$$

$$2) a) \quad h'(x) = \frac{4x(x+3) - 2x^2}{(x+3)^2}$$

$$\text{When } x=1, \quad h'(1) = \frac{4 \cdot (4) - 2}{4^2} = \frac{7}{8}$$

$$\text{and when } x=1, \quad h(1) = \frac{2}{1+3} = \frac{1}{2}$$

$$\therefore \text{eqn for tangent:} \quad \frac{y - \frac{1}{2}}{x - 1} = \frac{7}{8}$$

$$y = \frac{7}{8}(x-1) + \frac{1}{2}$$
$$= \frac{7}{8}x - \frac{3}{8}$$

b) tangent line is horizontal  
 $\Rightarrow g'(x) = 0$

$$\text{i.e.} \quad \frac{4x(x+3) - 2x^2}{(x+3)^2} = 0$$

$$2x^2 + 12x = 0$$

$$2x(x+6) = 0$$

$$\Rightarrow x=0 \text{ or } x=-6$$

3) a)  $x < -6, -4 < x < 2, 4 < x$

b)  $x < -5, -2 < x < 0, 1 < x < 3$

3) a)  $P'(t)$  means the rate of change of population at time  $t$  (year after 1950)  
unit = people/year

b)  $P'(25)$  is negative means the population is decreasing at the year 1975 (or at 25th year after 1950)

c)  $P'(40) = 0$  means the population remains constant at 1990 (or at 40th year after 1950)