There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. [9 points] You and your friend leave campus at the same time. You walk due north at 4 kilometers per hour while your friend walks due east at 6 kilometers per hour. After you have traveled 2 kilometers, at what rate is the distance between you changing?

y = distance you have travelled in lem L = distance friend has travelled in km ) = distance between you and friend

 $(y^2 + f^2) = \frac{d}{dt} D^2$ 

dt J 2 y dt + 2 f dt = 2 D dt 2 y dt + 2 f dt = 2 D dt We know that when you have walked 2 km, we know that passed, so your friend has 0.5 hrs have passed, so your friend has walked 3 km, and, 2<sup>2</sup>+3<sup>2</sup> = D<sup>2</sup>, so D = √13. Moreover, dy - x4 dt = 6. So we have  $)=2\sqrt{13}\frac{dD}{dP}$ 

So 
$$\frac{dD}{dt} = \frac{26}{\sqrt{13}} \frac{km}{hr}$$

- **2.** [8 points] Let  $g(x) = x + 6e^{2x}$ .
  - **a.** Find the linear approximation of g(x) at x = 0.

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$$g(x)$$
 at  $x = 0$ .  

$$g'(x) = 1 + 12e^{2x}$$

$$g'(6) = 13(x - 0)$$

$$g'(6) = 13$$

$$y = 13x + 6$$

$$12 = 13x + 6$$

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**b**. Find the differential of g(x).

$$dy = (1+1\lambda e^2)dx$$

**c**. If x changes from x = 0 to x = 0.1, estimate how much you expect g(x) to change. Express your answer as a decimal or as a simplified fraction,

$$dy = (1 + 1)^{2(0)} (0.1) = 1.3 \quad or \quad \frac{13}{10}$$

- **3.** [8 points] Let  $h(x) = 3x^4 4x^3 + 1$ .
  - **a.** Find all critical points of h(x).

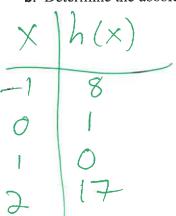
Find an erictal points of 
$$n(x)$$
.
$$h'(x) = 12 \times^3 - 12 \times^2$$

$$= 12 \times^2 (x - l)$$

$$12 \times^{2} (x-1) = 0$$

$$X = 0, X = 1$$

**b.** Determine the absolute maximum and absolute minimum of h(x) on the interval [-1,2]



**maximum value** of h(x): **minimum value** of h(x):