

Calculus 1 Exam # 2

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1. (10) Given that:

$$f'(0) = 2, \quad f'(2) = -6, \quad f'(3) = -1, \quad f'(4) = 1$$

$$g(0) = 2, \quad g'(0) = 3, \quad g(2) = 4, \quad g'(2) = -2$$

$$h(0) = 2, \quad h'(0) = -2, \quad h(2) = -3, \quad h'(2) = 4$$

evaluate $(f \circ g \circ h)'(0)$ (Notation: $(f \circ g \circ h)(x) = f(g(h(x)))$).

2. A particle is moving on a straight line and its equation is given by

$$x(t) = t^3 - 6t^2 - 15t$$

determine when the object is moving right (10).

determine when the object is speeding up (10).

3. (10) Compute the derivative of $f(x) = \left(\frac{x+1}{x^2+1}\right)^3$ at $x = 1$.
4. (10) An object is propelled vertically upward from a height of 10 feet. Determine the initial velocity v_0 so that this object reaches the ground after exactly 10 seconds. You may take g to be $32ft/s^2$.
5. (10) Determine the numbers x between 0 and 2π where the tangent to the curve $y = \sin x + \sqrt{3}\cos x$ is horizontal.

6. (10) Compute $\frac{d^3}{dx^3}(x^2 - \frac{1}{x^3})$

7. (10) Compute the equation for the tangent line to $y = \sqrt{x}$ at $x = 4$.

8. (10) Compute the derivative of $f(x) = \frac{1}{1+\tan^2 x}$ at $x = \frac{\pi}{4}$.

9. (10) Determine $\frac{dy}{dx}$, given $y^2 + xy - x^2 = 1$. Determine $\frac{d^2y}{dx^2}$ (5 bonus).