PART 1. This portion of the exam is to test basic calculation skills to a correct solution. The questions are multiple choice with “None of these” as a possible valid choice. No partial credit is given in this section, so work very carefully. Value: 7 points each

1. The derivative of \( f(x) = 7x^5 - 6x^2 + 4x + 5 \), after simplification, is:

A) \( 7x^3 - 6x^2 + 4 \)  
B) \( 7x^6 - 6x^3 + 4x^2 + 5x \)  
C) \( 35x^4 - 12x + 4 \)  
D) \( 35x^4 - 12x^2 + 4 + 5x^{-1} \)  
E) \( 35x^5 - 12x^3 + 4x \)  
F) None of these.

2. The derivative of \( g(t) = (4t^2 + 1)^3 \), after simplification, is:

A) \( 24t(4t^2 + 1)^2 \)  
B) \( 3(4t^2 + 1)^2 \)  
C) \( 12t(4t^2 + 1)^2 \)  
D) \( 8t(4t^2 + 1)^2 \)  
E) \( (8t)^3 \)  
F) None of these.

3. The derivative of \( h(\theta) = 4\cos^2(3\theta) \), after simplification, is:

A) \( -12\sin^2(3\theta) \)  
B) \( -12\sin(3\theta)\cos(3\theta) \)  
C) \( 8\cos(3\theta) \)  
D) \( -8\cos(3\theta)\sin(3\theta) \)  
E) \( 4\sin^2(3\theta) \)  
F) None of these.
4. Find $h'(1)$ given that $h(x) = f(g(x))$ and the values $f(4) = -1$, $f(-2) = 1$, $f'(4) = 2$, $f'(-2) = 3$, and $g(1) = 4$ and $g'(1) = -2$,

\[ A) -4 \quad B) 2 \quad C) 12 \quad D) 8 \quad E) -4 \quad F) -6 \quad G) \text{None of these.} \]

5. The derivative, $\frac{dy}{dx}$, of the function given by the equation $y = \sec(x^5 + 1)$, after simplification, is:

\[ A) \sec(5x^4) \quad B) 5\sec(x^4) \quad C) \sec(x^5 + 1)\tan(x^5 + 1) \]
\[ D) 5x^4\sec(x^5 + 1)\tan(x^5 + 1) \quad E) 5x^4\tan(x^5 + 1) \quad F) 5x^4\tan^2(x^5 + 1) \quad G) \text{None of these.} \]

**Part 2:** This portion of the exam will be graded on a partial credit basis. **Answers without supporting work shown on the paper will receive NO credit.**

6. (7 points) Find the equation of the tangent line to the curve given by $y = (9 + x^2)^{3/2}$ at the point $x = 4$. 


7. Find the indicated derivatives. DO NOT SIMPLIFY YOUR ANSWERS. SHOW ALL WORK.
   (a) (8 points) \( g(x) = (-3x^2 + 4x + 12)(1 - 4x^3) \). \( g'(x) = \)
   
   (b) (8 points) \( h(t) = \frac{t^4 + 1}{1 - 5t^3} \). \( h'(t) = \)
   
   (c) (8 points) \( f(x) = (\sin(x^3) + x)^4 \). \( f'(x) = \)
   
   (d) \( p(x) = x^{3/5} + x^{1/4} - \frac{1}{5\sqrt[5]{x^5}} \). \( p'(x) = \)
(e) (8 points) Find \( \frac{dy}{du} \) using the chain rule when \( y = \cos(2x) \), \( x = u^3 + 1 \):

8. (9 points) The sum of two positive numbers is 48. What is the smallest possible value of the sum of their squares?

9. (9 points) Find the maximum and minimum of the function \( f(x) = x^{1/2} - x^{3/2} \) on the interval \([0, 4]\).