Warm-up Problems

1. Algebraically expand the following:
   
   (a) \((x + h)^2 =\) 
   (b) \((x + h)^3 =\) 
   (c) \((x + h)^4 =\) 
   (d) \((x + h)^5 =\) 

2. Using the limit definition of derivative, find \(f'(x)\).
   
   (a) \(f(x) = 4.\) \(f'(x) =\) 
   (b) \(f(x) = \pi.\) \(f'(x) =\) 
   (c) \(f(x) = 4x.\) \(f'(x) =\) 
   (d) \(f(x) = -12x.\) \(f'(x) =\) 

3. Using the limit definition of derivative, find \(f'(x)\).
   
   (a) \(f(x) = 3x^2 - 2x.\) \(f'(x) =\) 
   (b) \(f(x) = \frac{1}{x^2}.\) \(f'(x) =\) 

Lecture Problems

4. Find the following derivatives
   
   (a) \(\frac{d}{dx} (849x^{102}) =\) 
   (b) \(\frac{d}{dx} (4x^3 - 12x + 1) =\) 
   (c) \(\frac{d}{dx} \left(\frac{1}{x^2} - \sqrt{x}\right) =\) 
   (d) \(\frac{d}{dx} \left(\frac{4x^2}{\sqrt{x}} + 4x\right) =\) 
   (e) \(\frac{d}{dx} \left(\frac{4x^2 + 2x - 1}{x^4}\right) =\) 
   (f) \(\frac{d}{dx} \left(\frac{4x^2 + 2x - 1}{\sqrt{x}}\right) =\) 
   (g) \(\frac{d}{dx} \left(\frac{4x^2 + 2x - 1}{x - 3}\right) =\) 
   (h) \(\frac{d}{dx} \left(\frac{4x^2 + 2x - 1}{x^4 + 2}\right) =\) 

5. Find the following derivatives
   
   (a) \(\frac{d}{dx} (4e^x + 2x) =\) 
   (b) \(\frac{d}{dx} (13x^2 + 5e^x) =\) 
   (c) \(\frac{d}{dx} (12xe^x) =\) 
   (d) \(\frac{d}{dx} (12e^{2x} - 4x) =\)