

MA530. Homework 1

Homework due September 6, 2006

1. Find

- (a) $\lim_{x \rightarrow 8} \frac{\sqrt{9+2x}-5}{\sqrt[3]{x}-2}$
- (b) $\lim_{x \rightarrow 0} \frac{x^2}{\sqrt[5]{1+5x}-(1+x)}$
- (c) $\lim_{x \rightarrow +\infty} x \left(\sqrt{x^2 + 2x} - 2\sqrt{x^2 + x} + x \right)$
- (d) $\lim_{x \rightarrow 0} \frac{1-\cos(x)}{x^2}$
- (e) $\lim_{x \rightarrow 0} \frac{\cos(2x)-1}{\cos(x)-1}$

2. Differentiate

- (a) $y = \frac{\sin^2(3x)}{\cos^2(x)}$
- (b) $y = \cos(2x) + \sin^2(x)$
- (c) $y = \frac{\sin(3x)}{4+5\cos(2x)}$
- (d) $y = 2^{3x+1} \ln(5x-11)$

3. Integrate

- (a) $\int \left(6\cos(x) + \frac{1}{x} - \frac{3}{x^2+1} \right) dx$
- (b) $\int e^{\sin(x)} \cos(x) dx$
- (c) $\int \frac{(x^2-1)}{(x^4+3x^2+1) \arctan(\frac{x^2+1}{x})} dx$
- (d) $\int \frac{dx}{x^4+1}$
- (e) $\int \sqrt[3]{x} (\sqrt{x} + 1)^3 dx$
- (f) $\int \arctan(x) dx$
- (g) $\int_{\frac{1}{e}}^1 \frac{dx}{x(1+\ln(x))}$
- (h) $\int_1^e \frac{dx}{x(1+\ln^2(x))}$

4. Solve the initial value problem

$$(1 + e^y) dx - e^{2y} \sin^3(x) dy = 0 ; y\left(\frac{\pi}{2}\right) = 0$$