Departamento de Matemáticas
Facultad de Ciencias Naturales y Exactas
111051M - Cálculo II Gr. 05
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Septiembre 27 de 2018

Taller 8. Funciones hiperbólicas

1. Demuestre las siguientes identidades hiperbólicas.

   (a) $\cosh^2(x) - \operatorname{senh}^2(x) = 1$
   (b) $\tanh^2(x) + \operatorname{sech}^2(x) = 1$
   (c) $\coth^2(x) - \operatorname{csch}^2(x) = 1$
   (d) $\cosh(x+y) = \cosh(x)\cosh(y) + \operatorname{senh}(x)\operatorname{senh}(y)$
   (e) $\operatorname{senh}(x+y) = \operatorname{senh}(x)\cosh(y) + \operatorname{senh}(y)\cosh(x)$
   (f) $\tanh(x+y) = \frac{\tanh(x)+\tanh(y)}{1+\tanh(x)\tanh(y)}$
   (g) $\cosh(2x) = \cosh^2(x) + \operatorname{senh}^2(x)$
   (h) $\operatorname{senh}(2x) = 2\operatorname{senh}(x)\cosh(x)$
   (i) $\tanh(2x) = \frac{2\tanh(x)}{1+\tanh^2(x)}$
   (j) $\operatorname{senh}^2(x) = \frac{-1+\cosh(2x)}{2}$
   (k) $\cosh^2(x) = \frac{1+\cosh(2x)}{2}$

2. Determine la derivada de las siguientes funciones.

   (a) $f(x) = x^2 \tanh\left(\frac{1}{x}\right)$
   (b) $f(x) = \cosh(x)\, e^{\operatorname{sech}(x)}$
   (c) $f(x) = \operatorname{senh}\left(\sqrt{x}\right)$
   (d) $f(x) = \arctan(\tanh(x))$
   (e) $f(x) = \cosh(\ln(x))$
   (f) $f(x) = \frac{1}{x+\operatorname{csch}(x)\coth(x)}$
   (g) $f(x) = \operatorname{senh}^{-1}(2x)$
   (h) $f(x) = \coth^{-1}\left(\sqrt{1+x^2}\right)$
   (i) $f(x) = \operatorname{sech}^{-1}\left(\frac{1}{x}\right)$
   (j) $f(x) = \ln\left(\cosh^{-1}\left(1+e^{x^2}\right)\right)$

3. Determine las siguientes integrales indefinidas.

   (a) $\displaystyle\int x\operatorname{senh}(x)\,dx$
   (b) $\displaystyle\int x\cosh^2(x)\,dx$
   (c) $\displaystyle\int \frac{\operatorname{sech}\left(\sqrt{x}\right)\tanh\left(\sqrt{x}\right)}{\sqrt{x}}\,dx$
   (d) $\displaystyle\int \frac{\operatorname{senh}(x)}{\cosh^3(x)}\,dx$
   (e) $\displaystyle\int \frac{\operatorname{senh}(\ln x)}{x}\,dx$
   (f) $\displaystyle\int \operatorname{sech}^2(x)\,dx$
   (g) $\displaystyle\int \tanh^2(x)\,dx$
   (h) $\displaystyle\int \frac{\operatorname{senh}(x)}{1+\cosh(x)}\,dx$
   (i) $\displaystyle\int \frac{e^x - e^{-x}}{e^x + e^{-x}}\,dx$
   (j) $\displaystyle\int \frac{1}{\left(e^x + e^{-x}\right)^2}\,dx$

(k) $\int \frac{dx}{\sqrt{x^2+9}}$

(l) $\int \frac{dx}{\sqrt{4x^2-9}}$

(m) $\int \frac{\cos(x)}{\sqrt{1+\text{sen}^2(x)}}\,dx$

(n) $\int \frac{dx}{\sqrt{1-e^{2x}}}$

(o) $\int \frac{dx}{x\sqrt{x^2+25}}$

(p) $\int \frac{e^x}{\sqrt{e^{2x}+1}}\,dx$

(q) $\int \frac{x}{\sqrt{x^4-1}}\,dx$

(r) $\int \frac{dx}{4-x^2}$