Answer on Question #60616 – Math– Calculus

Question

differentiate following functions:

1. y= $2x^2e^{2x}$

2.y= $(x^2 -2) / (x^2 +2)$

3.y= $2\sin(3x^2 + 2x)$

Solution

Apply the table formulae of derivatives:

$$(c)' = 0;\ (x)' = 1;$$
$$(\sin(x))' = \cos(x);$$
$$(x^n)' = nx^{n-1};$$
$$(e^x)' = e^x$$

1. This problem requires using the product rule for the derivatives:

$$if\ \ f(x) = g(x)h(x)\ \ then\ f'(x) = g'(x)h(x) + g(x)h'(x),$$

and the chain rule:

$$if\ \ f(x) = g(h(x))\ then\ f'(x) = g'(h(x))h'(x)$$

$y = 2x^2e^{2x}$;

$$y' = (2x^2e^{2x})' = (2x^2)'\cdot e^{2x} + 2x^2\cdot(e^{2x})' = 2\cdot 2x\cdot e^{2x} + 2x^2\cdot e^{2x}\cdot(2x)' = 4xe^{2x} + 2x^2\cdot e^{2x}\cdot 2 =$$
$$= 4xe^{2x} + 4x^2e^{2x} = 4xe^{2x}(1+x)$$

Answer: $4xe^{2x}(1+x)$.

2. This problem requires using the quotient rule for the derivatives:

$$if\ \ f(x) = \frac{g(x)}{h(x)}\ \ then\ f'(x) = \frac{g'(x)h(x) - g(x)h'(x)}{h^2(x)}$$

$$y = \frac{(x^2-2)}{(x^2+2)}$$

$$y' = \left(\frac{(x^2-2)}{(x^2+2)}\right)' = \frac{(x^2-2)'(x^2+2) - (x^2-2)(x^2+2)'}{(x^2+2)^2} = \frac{2x(x^2+2) - 2x(x^2-2)}{(x^2+2)^2} =$$
$$= \frac{2x(x^2+2-x^2+2)}{(x^2+2)^2} = \frac{2x\cdot 4}{(x^2+2)^2} = \frac{8x}{(x^2+2)^2}$$

Answer: $\frac{8x}{(x^2+2)^2}$.

3. This problem requires using the chain rule for the derivatives:

$$if\ \ f(x) = g(h(x))\ then\ f'(x) = g'(h(x))h'(x)$$

y= $2\sin(3x^2 + 2x)$;

$$y' = \left(2sin(3x^2 + 2x)\right)' = 2sin'(3x^2 + 2x)\cdot(3x^2 + 2x)' = 2\cos(3x^2 + 2x)\cdot(3\cdot 2x + 2) =$$
$$= 2\cdot 2\cdot(3x+1)\cdot\cos(3x^2 + 2x) = 4(3x+1)\cdot\cos(3x^2 + 2x)$$

Answer: $4(3x+1)\cdot\cos(3x^2 + 2x)$.