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Math 31 Trig, Logs and Exponential Quiz

30/30

1. Evaluate the following limits algebraically:

a) $\lim_{x\to 0}\frac{\sin 3x}{4x}$

$= \lim_{x\to 0} \frac{3x\sin 3x}{(3x)(4x)}$ ✓

$= \lim_{x\to 0} \frac{3x}{4x}$

$= \frac{3}{4}$ ✓

b) $\lim_{x\to 0}\frac{\sin x}{x^2\cos x}$

$= \lim_{x\to 0} \frac{\sin x}{(x)(x)}$ ✓

$= \lim_{x\to 0} \frac{1}{x}$

∴ Does not exist ✓

2. Determine the derivatives of:

a) $y = x^3\tan(2x)$

$y' = x^3\sec^2(2x)(2) + (3x^2)(\tan 2x)$ ✓

b) $y = \cos(x^4)$

$y' = -\sin(x^4)(4x^3)$ ✓

c) $y = \sqrt{\tan 3x}$

$y' = \frac{1}{2}(\tan 3x)^{-1/2}(\sec^2(3x))(3)$ ✓

d) $\sin y = \cos 2x$

$\cos y(y') = -\sin(2x)(2)$

$y' = \frac{-\sin 2x\,(2)}{\cos y}$ ✓

e) $y = \ln(4x^3 - x)$

$y' = \frac{1}{4x^3 - x}(12x^2 - 1)$ ✓

f) $y = \cos e^x$

$y' = -\sin(e^x)(e^x)$ ✓

g) $y = 2x^2\ln(x^3 + 3)$

$y' = 2x^2\left(\frac{1}{x^3+3}\right)(3x^2) + (4x)(\ln(x^3+3))$ ✓

h) $f(x) = \frac{x}{e^x}$

$f'(x) = \frac{e^x - xe^x}{(e^x)^2}$ ✓

3. Determine the equation of the line tangent to the curve $y = \sin x - 2\cos x$ at the point where $x = 0$.

(y)

$y = \sin(0) - 2\cos(0)$

$= 0 - 2(1)$

$y = -2$

(m)

$y' = \cos x + 2\sin x$

$y' = \cos(0) + 2\sin(0)$

$= 1 + 2(0)$

$y' = 1$

(b)

$y = mx + b$

$-2 = 1(0) + b$

$b = -2$

$y = x - 2$ ✓

4. Find the equation of the line tangent to the curve $y = e^{-x} + e^{2x}$ at the where point $x = 0$.

(y)

$y = e^{-0} + e^{2(0)}$

$y = 1 + 1$

$y = 2$

(m)

$y' = -e^{-x} + e^{2x}(2)$

$y' = -e^{-0} + e^{2(0)}(2)$

$y' = 1$

(b)

$y = mx + b$

$2 = 1(0) + b$

$b = 2$ ✓

$y = x + 2$

5. Determine the equation of the line tangent to the curve $y = x \ln x$ at the point P(e, e).

(m)

$y' = x\left(\frac{1}{x}\right) + \ln x$

$y' = e\left(\frac{1}{e}\right) + \ln e$

$y' = 1 + 1$

$y' = 2$

(b)

$e = 2e + b$

$b = -e$

$y = 2x - e$ ✓