

QUIZ 2

7.3-7.4
25 points

NAME

Answers

Section _____ Wed 9/14/05

1. Find the exact value: a) $3^{2\log_3 2} =$

$$3^{\log_3 2^2}$$

4

b) $\log_2 28 - \log_2 7 =$

$$\log_2 \frac{28}{7} = 2$$

2

2. Solve for x.

a) $\log_3(4-2x) = 2$

$$3^2 = 4 - 2x$$

$$2x = 4 - 9$$

$$x = -5/2$$

b) $4e^{2x-1} = 8$

$$e^{2x-1} = 2$$

$$\ln 2 = 2x - 1$$

$$\frac{\ln 2 + 1}{2} = x$$

c) $2e^{2x} + 6e^x - 3 = 0$

$$(2e^x - 1)(e^x + 3)$$

$$e^x = 1/2 \quad e^x \neq -3$$

$$\ln 1/2 = x$$

3. Differentiate.

a) $f(x) = \ln(\cos^3 x)$

$$f'(x) = \frac{1}{\cos^3 x} \cdot 3\cos^2 x(-\sin x)$$

$$= \frac{-3\sin x}{\cos x} = -3\tan x$$

b) $y = \ln\left(\frac{x^3 \sin 3x}{\sqrt{4+x}}\right)$

$$y = 3\ln x + \ln \sin 3x - \frac{1}{2} \ln(4+x)$$

$$\frac{dy}{dx} = \frac{3}{x} + \frac{3\cos 3x}{\sin 3x} - \frac{1}{2} \cdot \frac{1}{4+x}$$

$$\frac{dy}{dx} = \frac{3}{x} + 3\cot 3x - \frac{1}{2(4+x)}$$

4. Find an equation of the tangent line to the curve $y = \log_3 x^3$ at the point (3,3)

$$y - y_1 = m(x - x_1)$$

$$y - 3 = \left(\frac{3}{\ln 3}\right)(x - 3)$$

or

$$y = \frac{3}{\ln 3}x - \frac{9}{\ln 3} + 3$$

$$y = \frac{x}{\ln 3} - \frac{3}{\ln 3} + 3$$

$$m = \frac{dy}{dx}$$

$$y = 3 \log_3 x$$

$$\frac{dy}{dx} = 3 \cdot \frac{1}{\ln 3} \text{ at } x = 3$$

5. Use logarithmic differentiation to find the derivative of a) $y = x^{\tan 2x}$

$$\ln y = \tan 2x \ln x$$

$$\frac{1}{y} \frac{dy}{dx} = \tan 2x \left(\frac{1}{x} \right) + \ln x (\sec^2 2x)(2)$$

$$\frac{dy}{dx} = \left(\frac{\tan 2x}{x} + 2 \ln x \sec^2 2x \right) (x^{\tan 2x})$$

b) $y = \sqrt{(x+1)^3(3x-1)}$

$$\ln y = \frac{3}{2} \ln(x+1) + \frac{1}{2} \ln(3x-1)$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{3}{2(x+1)} + \frac{1}{2(3x-1)}$$

$$\frac{dy}{dx} = \left(\frac{3}{2(x+1)} + \frac{1}{2(3x-1)} \right) \left(\sqrt{(x+1)^3(3x-1)} \right)$$

6. Evaluate:

a) $\int_0^2 \frac{x}{3+x^2} dx =$

$$\frac{1}{2} \int_0^2 \frac{1}{u} du$$

$$u = 3+x^2$$

$$du = 2x dx$$

$$\frac{1}{2} \ln(3+x^2) \Big|_0^2$$

$$\frac{1}{2} \ln(7) - \frac{1}{2} \ln(3)$$

b) $\int \frac{\cos(\ln x)}{x} dx =$

$$\int \cos u du$$

$$\sin u + C$$

$$\sin(\ln x) + C$$

$$u = \ln x$$

$$du = \frac{1}{x} dx$$

c) $\int \frac{e^{3x}}{3-e^{3x}} dx =$

$$-\frac{1}{3} \int \frac{1}{u} du$$

$$u = 3-e^{3x}$$

$$du = -3e^{3x} dx$$

$$-\frac{1}{3} \ln(e^{3x}) + C$$

$$-\frac{1}{3} e^{3x} + C$$

d) $\int \frac{2^{\sqrt{x}}}{\sqrt{x}} dx =$

$$2 \int 2^u du$$

$$u = \sqrt{x}$$

$$du = \frac{1}{2\sqrt{x}} dx$$

$$2 \cdot \frac{2^u}{\ln 2} + C$$

$$\frac{2^{u+1}}{\ln 2} + C$$