Review day 1

Thursday, September 21, 2017 11:15 AM

pg. 186 #5-23odd, 27, 32, 51ab pg. 178 #5, 12, 15, 22

constant

5. $e^{2x/3}$

$\frac{dy}{dx} = \frac{2}{3}e^{2x/3}$

7. $y = xe^2 - e^x$

$\frac{dy}{dx} = e^2 - e^x$

9. $y = e^{\sqrt{x}}$

$\frac{1}{2}x^{-1/2}e^{\sqrt{x}}$

$= \frac{e^{\sqrt{x}}}{2\sqrt{x}}$

11. $y = 8^x$

$\frac{dy}{dx} = 8^x \cdot \ln 8$

$= \ln 8 \cdot 8^x$

13. $y = 3^{\csc x}$

$\frac{dy}{dx} = 3^{\csc x} \cdot \ln 3 \cdot -\csc x \cot x$

$= -\ln 3 \cdot \csc x \cot x \cdot 3^{\csc x}$

15. $y = \ln(x^2)$

$\frac{dy}{dx} = \frac{1}{x^2} \cdot 2x$

$= \frac{2}{x}$

17. $y = \ln\left(\frac{1}{x}\right) = \ln(x^{-1})$

$\frac{dy}{dx} = \frac{1}{x^{-1}} \cdot -1x^{-2}$

$= \frac{-1}{x}, \ x > 0$

19. $y = \ln(\ln x)$

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

$= \frac{1}{x \ln x}, \ x > 0$

21. $y = \log_4 x^2$

$\frac{dy}{dx} = \frac{1}{\ln 4 \cdot x^2} \cdot 2x$

$= \frac{2}{x \ln 4}$ * $\ln 4 = \ln 2^2 = 2\ln 2$

$$= \frac{1}{x\ln 2}, \quad x > 0$$

23. $y = \log_2\left(\frac{1}{x}\right) = \log_2 x^{-1}$

$$\frac{dy}{dx} = \frac{1}{x^{-1} \cdot \ln 2} \cdot -1x^{-2}$$

$$= \frac{-1}{x\ln 2}, \quad x>0$$

27. $y = \log_{10} e^x$

$$\frac{dy}{dx} = \frac{1}{e^x \ln 10} \cdot e^x$$

$$= \frac{1}{\ln 10}$$

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

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

$$= \frac{1}{x} = m$$

$y = mx$ passes through origin & tangent line

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

$\ln\left(\frac{x}{3}\right) = \frac{1}{x} \cdot x = 1$

$e^1 = \frac{x}{3}$

$x = 3e$

So $m = \frac{1}{x} = \frac{1}{3e}$

51 $P(t) = \dfrac{300}{1+2^{4-t}}$

a. $P(0) = \dfrac{300}{1+2^4} \approx 18$ people

b. $P'(t) = \dfrac{(1+2^{4-t}) \cdot 0 - 300(2^{4-t} \cdot \ln 2 \cdot -1)}{(1+2^{4-t})^2}$

$= \dfrac{\ln 2 \cdot 300 \cdot 2^{4-t}}{(1+2^{4-t})^2}$

$P'(4) \approx 52 \dfrac{\text{people}}{\text{day}}$

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5. $y = \sin^{-1}\left(\frac{3}{t^2}\right) = \sin^{-1}(3t^{-2})$

$\dfrac{dy}{dt} = \dfrac{1}{\sqrt{1-\left(\frac{3}{t^2}\right)^2}} \cdot -6t^{-3}$

$= \dfrac{-6t^{-3}}{\sqrt{1-\frac{9}{t^4}}}$

$= \dfrac{-6t^{-3}}{\sqrt{\frac{t^4-9}{t^4}}}$

$= \dfrac{-6t^{-3}}{\frac{1}{t^2}\sqrt{t^4-9}}$

$= \dfrac{-6}{t\sqrt{t^4-9}}$

12. $x(t) = \tan^{-1}(t^2)$

$v(t) = x'(t) = \dfrac{1}{1+(t^2)^2} \cdot 2t = \dfrac{2t}{1+t^4}$

$v(1) = \dfrac{2}{1+1} = 1$

15. $y = \csc^{-1}(x^2+1) = \frac{\pi}{2} - \sec^{-1}(x^2+1)$

$$\frac{dy}{dx} = -1 \cdot \frac{1}{|x^2+1|\sqrt{(x^2+1)^2-1}} \cdot 2x$$

$$= \frac{-2x}{(x^2+1)\sqrt{x^4+2x^2+1-1}}$$

$$= \frac{-2x}{(x^2+1)\sqrt{x^2(x^2+2)}}$$

$$= \frac{-2x}{x(x^2+1)\sqrt{x^2+2}} \quad \text{since } x>0$$

$$= \frac{-2}{(x^2+1)\sqrt{x^2+2}}$$

22. $y = \cot^{-1}\frac{1}{x} - \tan^{-1}x$

$$= \frac{\pi}{2} - \tan^{-1}\left(\frac{1}{x}\right) - \tan^{-1}x$$

$$= \frac{\pi}{2} - \tan^{-1}(x^{-1}) - \tan^{-1}x$$

$$\frac{dy}{dx} = -\frac{1}{1+(x^{-1})^2} \cdot -1x^{-2} - \frac{1}{1+x^2} \cdot 1$$

$$= \frac{1}{x^2(1+x^{-2})} - \frac{1}{1+x^2}$$

$$= \frac{1}{x^2+1} - \frac{1}{x^2+1}$$

$$= 0$$