Quiz Review 4.1, 4.2

19. $y = \dfrac{3}{\sqrt{2x+1}}$

$3(2x+1)^{-\frac{1}{2}}$

$-\frac{3}{\cancel{2}}(2x+1)^{-\frac{3}{2}}(\cancel{2})$

$-3(2x+1)^{-\frac{3}{2}}$ $\qquad \dfrac{-3}{(2x+1)^{\frac{3}{2}}}$ $\qquad \dfrac{-3}{(\sqrt{2x+1})^3}$

In Exercises 29–32, find y''.

29. $y = \tan x$

32. $y = 9\tan(x/3)$

$y' = \sec^2 x$

$y' = (\sec x)^2$

$y'' = 2\sec x \sec x \tan x$

$= 2\sec^2 x \tan x$

In Exercises 29–32, find y''.

29. $y = \tan x$

32. $y = 9\tan(x/3)$

$y = 9\tan\left(\frac{1}{3}x\right)$

$y' = \cancel{9}\sec^2\left(\frac{1}{3}x\right)\left(\frac{1}{\cancel{3}}\right)$

$y' = 3\sec^2\left(\frac{1}{3}x\right)$

$y' = 3\left[\sec\left(\frac{1}{3}x\right)\right]^2$

$\left[\sec\left(\frac{x}{3}\right)\right]^2$

$y'' = 6\left[\sec\left(\frac{1}{3}x\right)\right]\sec\left(\frac{1}{3}x\right)\left(\tan\frac{1}{3}x\right)\left(\frac{1}{3}\right)$

$y'' = 2\sec^2\left(\frac{x}{3}\right)\tan\left(\frac{x}{3}\right)$

In Exercises 33–38, find the value of $(f \circ g)'$ at the given value of x.

33. $f(u) = u^5 + 1, \quad u = g(x) = \sqrt{x}, \quad x = 1$

$f(x) = (\sqrt{x})^5 + 1$

$f(x) = x^{\frac{5}{2}} + 1$

$\boxed{f'(x) = \frac{5}{2}x^{\frac{3}{2}}}$

$f'(1) = \frac{5}{2}(1)^{\frac{3}{2}}$

$= \frac{5}{2}$

34. $f(u) = 1 - \dfrac{1}{u}, \quad u = g(x) = \dfrac{1}{1-x}, \quad x = -1$

$f(x) = 1 - \dfrac{1}{\frac{1}{1-x}}$ $\quad 1 \cdot \dfrac{1-x}{1}$

$f(x) = 1 - (1-x)$ $\quad 1 - 1 + x$

$f(x) = x$

$\boxed{f'(x) = 1}$

36. $f(u) = u + \dfrac{1}{\cos^2 u}, \quad u = g(x) = \pi x, \quad x = \frac{1}{4}$

$f(x) = \pi x + \dfrac{1}{\cos^2(\pi x)}$

$f(x) = \pi x + [\cos(\pi x)]^{-2}$

$f'(x) = \pi - 2[\cos(\pi x)]^{-3}(-\sin(\pi x))\pi$

$= \pi + \dfrac{2\pi \sin(\pi x)}{[\cos(\pi x)]^3}$

$f'(x) = \pi + \dfrac{2\pi \sin(\frac{\pi}{4})}{[\cos(\frac{\pi}{4})]^3}$

$= \pi + 2\pi\left[\dfrac{\frac{\sqrt{2}}{2}}{(\frac{\sqrt{2}}{2})^3}\right]$

$= \pi + 2\pi\left[\dfrac{1}{(\frac{\sqrt{2}}{2})^2}\right]$

$\pi + 2\pi\left[\dfrac{1}{\frac{2}{4}}\right]$

$\pi + 2\pi\left[\frac{4}{2}\right]$ $\quad \pi + 4\pi = \boxed{5\pi}$

$\pi + 2\pi(2)$

In Exercises 1–8, find dy/dx.

1. $x^2y + xy^2 = 6$ **2.** $x^3 + y^3 = 18xy$

$$x^2 \cdot y + x \cdot y^2 = 6$$

$$x^2\frac{dy}{dx} + 2xy + x\,2y\frac{dy}{dx} + 1y^2 = 0$$

$$x^2\frac{dy}{dx} + 2xy\frac{dy}{dx} = -2xy - y^2$$

$$\frac{\frac{dy}{dx}(x^2+2xy)}{x^2+2xy} = \boxed{\frac{-2xy-y^2}{x^2+2xy}} = \frac{dy}{dx}$$

In Exercises 17–26, find the lines that are **(a)** tangent and **(b)** normal to the curve at the given point.

17. $x^2 + xy - y^2 = 1,\quad (2, 3)$

18. $x^2 + y^2 = 25,\quad (3, -4)$

$-xy$ $\quad [x\frac{dy}{dx} + 1y]$

(17) $x^2 + xy - y^2 = 1$

$$2x + x\frac{dy}{dx} + 1y - 2y\frac{dy}{dx} = 0$$

$$x\frac{dy}{dx} - 2y\frac{dy}{dx} = -2x - y$$

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

$$\frac{dy}{dx} = \frac{-2x-y}{x-2y}\bigg|_{(2,3)} \quad \frac{(-1)}{(-1)}$$

$$\frac{2x+y}{2y-x}\bigg|_{(2,3)}$$

$$\frac{4+3}{6-2} \quad \frac{7}{4}$$

56. *Working with Numerical Values* Suppose that functions f and g and their derivatives have the following values at $x = 2$ and $x = 3$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	8	2	1/3	−3
3	3	−4	2π	5

Evaluate the derivatives with respect to x of the following combinations at the given value of x.

(e) $f(g(x))$ at $x = 2$

(g) $1/g^2(x)$ at $x = 3$

e) $[f(g(x))]'$

$f'(g(x)) \cdot g'(x)$

$f'(g(2)) \cdot g'(2)$

$f'(2)(-3)$

$\frac{1}{3}(-3) = \boxed{-1}$

$[g(x)]^{-2}$

$-2[g(x)]^{-3} \cdot g'(x)$

$\frac{-2}{[g(x)]^3} \cdot g'(x)$

$\frac{-2}{[g(3)]^3} \cdot g'(3)$

$\frac{-2}{(-4)^3}(5)$

$\frac{-2}{-64}(5)$

$\boxed{\frac{5}{32}}$