***HW53: Unit 7 Test Review***

Differentiate.

1. $f(x) = 4x\sqrt{2x-3}$
2. $y = \dfrac{4}{3-x^2}$
3. $r(x) = 2\tan^2 x$
4. $y = 2\cos 4x$
5. $y = \ln(\sin x)$
6. $g(v) = -5^{3x^2}$
7. $y = \dfrac{5}{x^2} - \dfrac{7}{2x} + \dfrac{4}{3}$
8. $y = 2\sec 3x \tan 3x$
9. $f(x) = \left(\dfrac{4}{x} - 7x^2\right)^3$
10. $y = 7e^{\cos^2 x}$
11. $r(x) = 3\ln(3x^2 - 2x)$
12. $y = \sqrt[5]{7x^2 - 1}$
13. $y = \dfrac{e^{x+2}}{\cot(2x+3)}$
16. $5x^2y - 2x + y^2 = 7$
17. $\sin x + \sin y = xy^2$
18. $y = \dfrac{5\sqrt{x^2 - 2x}}{x^4 - 7x^2 + 9}$
19. $y = \dfrac{\sqrt[3]{x^2}\,(3x^2 - 4x)}{(x^4 - 2)^2}$

Find an equation of the tangent line at the given point or value.

20. $f(x) = -3x^2 - 2x + 3$ at $x = -2$
21. $x^2 + 5xy^2 + 2y^2 = 29$ at $(1, 2)$
22. $g(x) = 2\tan x$ at $x = \dfrac{\pi}{4}$
23. $x^3 - y^3 = 7$ at $(-1, -2)$

Find or evaluate the higher derivatives.

24. Find $\dfrac{d^2y}{dx^2}$ for $y = -\sqrt{2x-3}$
25. Find $g''(-1)$ for $g(x) = \dfrac{3x-4}{4x+1}$
26. Find $\dfrac{d^2y}{dx^2}$ for $y = 3\cos(2x)$
27. Find $\dfrac{d^2y}{dx^2}$ for $x^3 + y^2 = 3$

Answers

1. $f'(x)=\dfrac{12x-12}{\sqrt{2x-3}}$
2. $\dfrac{dy}{dx}=\dfrac{8x}{\left(3-x^2\right)^2}$
3. $r'(x)=4\sec^2 x\tan x$
4. $y'=-8\sin 4x$
5. $y'=\cot x$
6. $g'(x)=-6x(5)^{3x^2}\ln 5$
7. $\dfrac{dy}{dx}=-\dfrac{10}{x^3}+\dfrac{7}{2x^2}$
8. $y'=6\sec 3x\left(\tan^2 3x+\sec^2 3x\right)$
9. $f'(x)=3\left(\dfrac{4}{x}-7x^2\right)^2\left(-\dfrac{4}{x^2}-14x\right)$
10. $y'=-14\sin x\cos xe^{\cos^2 x}$
11. $r'(x)=\dfrac{18x-6}{3x^2-2x}$
12. $\dfrac{dy}{dx}=\dfrac{14x}{5\left(7x^2-1\right)^{4/5}}$
13. $\dfrac{dy}{dx}=\dfrac{e^{x+2}\left[\cot(2x+3)+2\csc^2(2x+3)\right]}{\cot^2(2x+3)}$
14. $\dfrac{dy}{dx}=\dfrac{2-10xy}{5x^2+2y}$
15. $\dfrac{dy}{dx}=\dfrac{\cos x-y^2}{2xy-\cos y}$
16. $\dfrac{dy}{dx}=\left(\dfrac{x-1}{x^2-2x}-\dfrac{2x\left(2x^2-7\right)}{x^4-7x^2+9}\right)\left(\dfrac{5\sqrt{x^2-2x}}{x^4-7x^2+9}\right)$
17. $\dfrac{dy}{dx}=\left(\dfrac{2}{3x}+\dfrac{6x-4}{3x^2-4x}-\dfrac{8x^3}{x^4-2}\right)\left(\dfrac{\sqrt[3]{x^2}\left(3x^2-4x\right)}{(x^4-2)^2}\right)$
18. $y=10x+15$
19. $y=-\dfrac{11}{14}x+\dfrac{39}{14}$
20. $y=4x-\pi+2$
21. $y=\dfrac{1}{4}x-\dfrac{7}{4}$
22. $\dfrac{d^2y}{dx^2}=\dfrac{1}{\sqrt{(2x-3)^3}}$
23. $g''(-1)=\dfrac{152}{27}$
24. $\dfrac{d^2y}{dx^2}=-12\cos 2x$
25. $\dfrac{d^2y}{dx^2}=\dfrac{-12xy^2-9x^4}{4y^3}$