Derivatives

1. Find $f'(1)$ if $f(x)=\left(x^4-x^2\right)\left(2x^3+x\right)$.

2. Find $f'(x)$ if $f(x)=\sqrt{x^4+x^2}$

3. Find $f'(x)$ at $x = 2$ if $f(x)=\dfrac{x^2+2x}{x^4-x^3}$

4. Find $f'(x)$ if $f(x)=\dfrac{x^2-1}{x-1}$

5. Find $\dfrac{dy}{dx}$ at $x = 1$ if $y=\dfrac{t^2+2}{t^2-2}$ and $t=x^3$

6. Find $\dfrac{dy}{dx}$ if $y=\cos^2 x$

7. Find $\dfrac{dy}{dx}$ if $y=\sqrt{\sin 3x}$

8. Find y' if $y=\csc^2 x^2$

9. Find $\dfrac{dr}{d\theta}$ if $r=\cos\left(1+\sin\theta\right)$

10. Find $\dfrac{d^2y}{dx^2}$ if $\cos y=\sin x+1$

11. Find $\dfrac{dr}{d\theta}$ if $r=\dfrac{\sec\theta}{1+\tan\theta}$

12. Find $\dfrac{dy}{dx}$ if $y=\sin\left(\cos\left(\sqrt{x}\right)\right)$

13. Find $\dfrac{dy}{dx}$ at $(1,1)$ if $x^{\frac{1}{2}}+y^{\frac{1}{2}}=2y^2$

14. Find $\dfrac{dy}{dx}$ at $(2,1)$ if $\dfrac{x+y}{x-y}=3$

15. Find the equation of the tangent to the graph of $y=\dfrac{x^2+4}{x-6}$ at $x=5$.

16. Find the values of x where the tangent to the graph of $y=2x^3-8x$ has a slope equal to the slope of $y=x$.

17. Find the coordinates where the tangent to the graph of $y=8-3x-x^2$ is parallel to the x-axis.

Related Rates

18. A spherical balloon is inflating at a rate of 27π in^3 / sec. How fast is the radius of the balloon increasing when the radius is 3 in?

19. A cylindrical tank with a radius of 6 meters is filling with a fluid at a rate of 108π m^3 / sec. How fast is the height increasing?

20. A boat is being pulled toward a dock by a rope attached to its bow through a pulley on the dock 7 feet above the bow. If the rope is hauled in a rate of 4 ft / sec, how fast is the boat approaching the dock when 25 feet of rope is out?

Chapter 2 Review Worksheet Answers

1. $f'(x)=6$

2. $\dfrac{2x^2+1}{\sqrt{x^2+1}}$

3. $f'(x)=\dfrac{-2x^2-5x+4}{x^3(x-1)^2}$

$f'(2)=-\dfrac{7}{4}$

4. $f'(x)=1$

5. $y'=\dfrac{-24x^5}{(x^6-2)^2}$

$y'(1)=-24$

6. -2 sin x cos x or -sin 2x

7. $\dfrac{dy}{dx}=\dfrac{3\cos 3x}{2\sqrt{\sin 3x}}$

8. $\dfrac{dy}{dx}=-4x\csc^2(x^2)\cot(x^2)$

9. $\dfrac{dr}{d\theta}=-\cos\theta\sin(1+\sin\theta)$

10. $\dfrac{\sin x\sin^2 y-\cos^2 x\cos y}{\sin^3 y}$

11. $\dfrac{\sec\theta(\tan\theta-1)}{(1+\tan\theta)^2}$

* $\tan^2\theta-\sec^2\theta=-1$

12. $y'=\dfrac{-\cos(\cos\sqrt{x})(\sin\sqrt{x})}{2\sqrt{x}}$

13. $\dfrac{1}{7}$

14. $\dfrac{1}{2}$

15. $y+29=-39(x-5)$

16. $x=\pm\sqrt{\dfrac{3}{2}}$

17. $\left(-\dfrac{3}{2},\dfrac{41}{4}\right)$

18. $\dfrac{3}{4}\dfrac{in.}{\sec.}$

19. 3 $\dfrac{m.}{\sec.}$ * *r* will not change

20. $-\dfrac{25}{6}\dfrac{ft.}{\sec.}$ * *h* will not change

* negative $\because$ going towards dock