Lab Worksheet for September 7, 2021

Practice with Derivatives Using the Chain Rule.

Find the derivative of the following functions (1-15).

1. **$f(x) = (3x^2 + 1)^2$.**

2. **$g(x) = (2x^3 + 2x - 1)^4$.**

3. **$h(x) = \sin^3(x)$.**

4. **$f(x) = \cos(5x^2)$.**

5. **$g(x) = \sin(7x + 2)$.**

6. **$f(x) = \cos(x^3)$.**

7. **$g(x) = \sin(3x^2 + 2x + 10)$.**

8. **$h(x) = \sin^6(x)$.**

9. **$f(x) = (\cos(x) – \sin (x))^5$.**

10. **$g(x) = 5(6x)^2$.**

11. **$h(x) = – \sin^2 (x^2 + 3x + 1)$.**

12. $f(x) = 3\cos^3(3x)$.

13. $g(t) = 10\sin^3 (2t^4 + 3t^2 – 1)$.

14. $h(x) = \sin((x^7 – 5x^2)^3)$.

15. $f(x) = \sin(\sin(\sin(x))$.

16. Find the equation of the line tangent to the graph of $f(x) = (x^2 – 2)^3$ at $x = -2$.

17. Find the equation of the line tangent to the graph of $f(x) = (3x - 5)^2$ at $x = 2$.

18. A bird is ascending into the sky, and its altitude at time t is modelled by the function

$H(t) = 30\,t - 9.8\,t^2$

where t is in seconds, and H is measured in meters. Moreover, the air pressure of Earth's atmosphere is (fictionally) modeled by the formula

$$P(H) = 1 - \frac{H}{10000} + \frac{H^2}{20000}$$

where P is in bars, and H is in meters.

At time t=1 seconds, how quick a change in air pressure is the bird experiencing? Your answer should be in bars per second.

19. The population of sloths in the rainforest (fictionally) depends on the area of available rain forest as follows:

$$P(A) = 10A + \frac{A^2}{10000}$$

Where A is measured in kilometers-squared, and P is in hundreds of sloths. Humans are destroying the rain forest, and the amount of available rain forest can be (fictionally) modelled as follows:

$A(t) = 10{,}000 - 2{,}000t$

Where t is in years and A is measured in kilometers-squared.

At t=3 years, at what rate is the population of sloths changing? Your answer should be in hundreds of sloth per year.