

Differentiate the given functions. Problems 16 through 21.

16. $f(x) = e^{7x^2}$

17. $f(x) = \ln(x^2 - 3x + 9)$

18. $3xe^{5x}$

19. $f(x) = e^x \ln x$

20. $f(x) = \sqrt{e^x + x}$

21. $f(x) = \frac{\ln 2x}{5x}$

22. Find the equation for the tangent line to $f(x) = x - \ln x$ where $x = e$.

Graph the following functions: (Problems 23 and 24)

23. $g(x) = 5 - e^x$

24. $f(x) = 5 - e^{-x}$

25. It is estimated that t years from now the population of a certain country will be P million people, where $P(t) = \frac{60}{3+2e^{-0.05t}}$

a. Sketch the graph of $P(t)$

b. What is the current population?

c. What will the population be in 20 years?

d. What will happen to the population in the long run?

Answer Key

1. a. 7.389 b. 4.482 c. .990 d. 1/9

2 a. 16 b. -27 c. 1/27 d. $\frac{1}{x^{\frac{8}{3}}}$

3. 208,265.92 4. 219,589.41 5. 15,576.02

6. a. 49 million people b. 66,143,082 people 7. 125 8. 8,000

9. a. 7 b. 2 c. -2.079 d. $\ln(9) = 2.197$

10. -0.347 11. 23.104 years 12. 5.776% 13. 173.287 years

14. 2,000 years 15. $Q(t) = 500e^{0.0336472237t}$ 16. $(14x)(e^{7x^2})$

17. $\frac{2x-3}{x^2-3x+9}$ 18. $(15x+3)e^{5x}$ 19. $e^x(\frac{1}{x} + \ln x)$

20. $\frac{e^x+1}{2\sqrt{e^x+x}}$ 21. $\frac{1-\ln(2x)}{5x^2}$ 22. $y = 0.632x$

23.

24.

25. a. b. 12 million c. 16,060,994 d. Approaches 20 million