

MATH 128 Exam 1 Review SOLUTIONS:

1. $\frac{x^3}{3} + \frac{x^2}{2} - 6x + k$

2. $\frac{1}{4} \ln(2x^2 + 4x + 5) + k$

3. $\frac{2(1 + f(x))^{\frac{3}{2}}}{3} + k$

4. $2(x \ln x - x) + k$

5. 96 ft.

6. \$60,683

7. $\frac{1}{3}(t^3 - 1)$

8. 8

9. \$150

10. \$58,315

11. \$422

12. 8.5 years

13. $\frac{\sqrt{2}}{2}$

14.

a. $\frac{dR}{dq} = 200 - 12\sqrt{q}$ $R(0) = 0$

$$R(q) - R(0) = \int_0^q 200 - 12\sqrt{q} dq \quad \Rightarrow \quad R(q) = 200q - 8q^{\frac{3}{2}}$$

b. $R(100) = 200(100) - 8(100)^{\frac{3}{2}} = 12,000$

c. $R'' = \frac{-12}{2} q^{-\frac{1}{2}} \quad \Rightarrow \quad R''(100) < 0 \quad \therefore \text{decreasing}$

$$15. \frac{dT}{dt} = -15e^{-0.2t} \quad T(0) = 75$$

$$T(t) - T(0) = \int_0^t -15e^{-0.2t} dt = -15 \frac{e^{-0.2t}}{-0.2} \Big|_0^t$$

$$\Rightarrow T(t) - 75 = \frac{15}{0.2} (e^{-0.2t} - 1) = 75(e^{-0.2t} - 1)$$

$$\Rightarrow T(t) = 75e^{-0.2t}$$

$$T(10) = 75e^{-0.2(10)} = 10.2$$

$$16. \frac{dP/dt}{P} = \frac{1}{t+1} \quad \therefore \ln P = \ln(t+1) + C$$

$$P(0) = 100 \quad \therefore \ln(100) = \ln(1) + C \quad \Rightarrow \quad C = \ln(100)$$

$$P(t) = (t+1) \times 100$$

$$P(100) = 101 \times 100 = 10,100$$

$$17. S(t) - S(0) = \int_0^t V(t) dt = \int_0^t \frac{\ln(1+t)}{1+t} dt \quad \therefore \quad S(t) = \frac{(\ln(1+t))^2}{2} \Big|_0^t = \frac{(\ln(1+t))^2}{2}$$

$$S(10) = \frac{(\ln 11)^2}{2} \cong 2.87$$

$$18. FV = \frac{12,000}{0.07} (e^{0.07 \times 20} - 1)$$

$$PV = \frac{12,000}{0.07} (1 - e^{-0.07 \times 20})$$

$$19. \frac{49}{3} + 3 \ln 2$$

$$20. -20e^{-0.05t} + C$$

$$21. (\ln x)^3 / 3 + C$$

$$22. x \ln 2x - x + C$$

$$23. -xe^{-x} - e^{-x} + C$$

24. $\frac{1}{2}e^{x^2} + C$

25. Divergent or ∞

26. $\frac{3}{5}$

27. 3^x

28. $\frac{7}{3}$

29. $\frac{13}{3}$

30. \$17,909

31. 11 years and 2 months

32. 22,890

33. 0.0677