FINAL Handout
MATH 253

1. Derive the formula for the volume of

   (a) a shere with radius R $\qquad$ $\left(V = \frac{4}{3}\pi R^3\right)$

   (b) a cone with radius R and the height H $\qquad$ $\left(V = \frac{1}{3}\pi R^2 H\right)$

2. Derive the formula for circumference of a circle with radius R. $(c = 2\pi R)$

3. Find the arclength of the curve $(y - 1)^2 = (1 - x)^3$ between $P(0, 2)$ and $R(1, 1)$.

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4. Find the domain of definition of $f(x) = \sqrt{9 - x^2}$ and then find the antiderivative $F(x) = \int f(x)dx$ - NOT using Tables.(Area of a circle)

5. Approximate $\arcsin \frac{1}{3}$ using the Taylor polynomial of third degree T_3 centered at 0.

6. Find the general solution of $x^2 y' - 4y = x^3 \cdot \ln x \cdot e^{-4/x}$.

7. Solve the initial value problem

   $$y'' + 4y' + 4y = 8x^2, \qquad y(0) = 2, \quad y'(0) = 4..$$

8. Find the general solution of the differential equation

   $$y'' + 9y = 10\sin 2x + e^{-x}$$

9. Find the domain and antiderivative of the following functions:

   a. $\quad x \arcsin(2x)$

   b. $\quad \dfrac{x^2 + 2}{x - x^2}$

   c. $\quad x \ln(2x + 3)$

   d. $\quad \dfrac{1}{\sqrt{e^x + 1}}$