

Math 142, Test1, practice problems

1. A farmer has 2000 *ft* of fencing and want to fence off a rectangular field that borders a straight river. He needs no fence along the river. Find the dimensions of the field that has the largest area.

Answer: The rectangular field should be 500 *ft* deep and 1000 *ft* wide.

2. A right circular cylinder is inscribed in a cone with height 4 and base radius 2. Find the largest possible volume of such a cylinder.

Answer: The height should be the same as the radius, namely $\frac{4}{3}$.

3. A right circular cylinder is inscribed in a sphere of radius 2. Find the largest possible volume of such a cylinder.

Answer: $\frac{32}{9}\sqrt{3}\pi$.

4. Use Newton's method to find approximations x_2, x_3 of $\sqrt{2}$ given $x_1 = 1$.

Answer: $x_2 = \frac{3}{2}, \quad x_3 = \frac{17}{12}$.

5. A car is traveling 70 *ft/s* when the brakes are fully applied, producing a constant deceleration of -14 *ft/s*². Find the distance covered before the car comes to a stop.

Answer: 175 *ft*.

6. A stone is dropped off a cliff and hit the ground with a velocity -128 *ft/s*. Find the height of the cliff.

Answer: 256.

7. Set up the Reimann sums and evaluate

$$\int_0^2 (x^3 - x^2 + 2x)dx.$$

Answer:

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \left(\left(\frac{2i}{n} \right)^3 - \left(\frac{2i}{n} \right)^2 + 2 \left(\frac{2i}{n} \right) \right) \frac{2}{n},$$

and the sum is $\frac{16}{3}$.

8. By using Fundamental Theorem of Calculus, find the derivative of

$$g(x) = \int_x^{\sqrt{x}} (e^t + \sec^2 t) dt$$

with respect to x .

Answer:

$$\left(e^{\sqrt{x}} + \sec^2 \sqrt{x} \right) \frac{1}{2\sqrt{x}} - (e^x + \sec^2 x).$$

9. By using Fundamental Theorem of Calculus, evaluate the definite integral

$$\int_{\pi/2}^{\pi} \left(e^x + \frac{1}{x^2} + \cos x \right) dx.$$

Answer:

$$e^\pi - e^{\pi/2} + \frac{1}{\pi} - 1.$$