Practice Midterm1, Sec61, F17

Sec5.3. Volume. LecNote1.

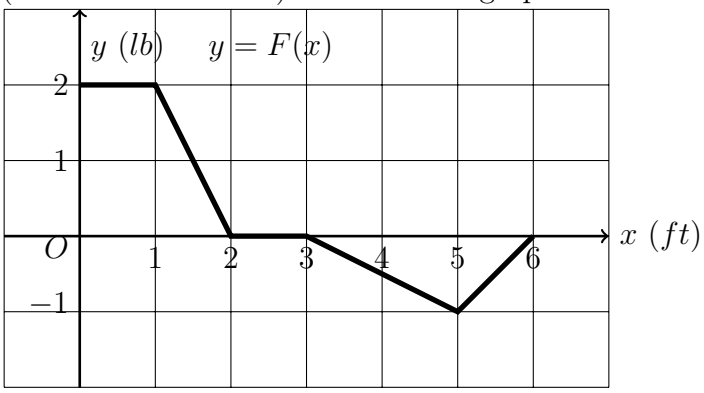
Q1 Find the volume of the following rotating solids.

(a)(Vertical Axe) The region R is bounded by $y = \sqrt{x-1}, y = 2, x = 0, y = 0$. The solid is generated by revolving the region R about the y axis. Sketch the region R and the rotating solid S. Find the volume of the rotating solid.

(b)(Horizontal Axe) The region R is bounded by $y = \sqrt{x-1}, y = 0, x = 5$. The solid is generated by revolving the region R about the axis $y = -1$. Sketch the region R and the rotating solid S. Find the volume of the rotating solid.

Sec5.4. Work. LecNote2.

Q2(Definition of Work.) Below is the graph of a force function $F(x)$ (in lbs).



(a) How much work is done by the force in moving an object from $x = 0$ to $x = 3$?

(b) How much work is done by the force in moving an object from $x = 0$ to $x = 5$?

Q3(Water-Pumping) A tank is in the shape of a downward-pointing cone (vertex at the bottom) has height 2 ft and radius 1 ft. It is filled of soda half the height of the full tank (1 ft above the bottom.) The soda weighs 63 lbs/ft^3. How much work does it take to pump all of the soda from a tank to an outlet which is at the level of the top of the tank.

Sec6.1. LecNote2. Sec6.2-6.4. LecNote3. Sec6.6-6.7. LecNote4.

Q4 Derivatives of the inverse functions/inverse trig/log/exp/hyperbolic functions.

(a)(Sec6.1,6.4) $f(x) = x^2 + \log_2(x+1) + 1$, find $(f^{-1})'(1)$ given $f(0) = 1$.

(b)(Sec6.4,6.6) $f(x) = 3^{\sin^{-1}(x)}$, find $f'(x)$ and $f'(\frac{1}{2})$.

(c)(Sec6.3,6.6) $y = [\tan^{-1} x]^{\ln(\sqrt{x})}$, find y' and $y'(1)$.

(d)(Sec6.2,6.7) $y = \sinh(2x)$, find $y'(0)$ and $y''(0)$.

Sec6.5/9.3. Initial Value Problems. LecNote3.

Q5 A population $P(t)$ of insects increases according to the following law $P'(t) = k(P - 100)$. Suppose there are 500 insects at time $t = 0$, and 700 insects 5 days later. Find an expression for the number $P(t)$ of insects at time $t > 0$(in days). How many insects will there be in 5 more days?

Q6 Find the solution to the initial value problem

$$\frac{dy}{dx} = \frac{xe^{x^2}}{y}, \quad y(0) = -3$$

Sec6.8. l'Hopital Rule. LecNote4.

Q7 Determine whether the following limits exist or not. Find the limit if it exists.

(a)

$$\lim_{x\to 0} \frac{\sec x - 1}{e^x - 1}$$

(b)

$$\lim_{x\to 0} x \ln(x^2)$$

(c)

$$\lim_{x\to +\infty} (2x)^{\frac{1}{x}}$$

Sec7.1-7.4. Methods of Integration. LecNote5. LecNote6.
Q8 Evaluate the following integrals

(a)(Sec7.1.IBP)

$$\int (\ln x)^2 \mathrm{d}x$$

(b)(Sec7.2.TrigInt)

$$\int \sin^3 x \cdot \cos^{61} x \ \mathrm{d}x$$

(c)(Sec7.3.TrigSub)

$$\int \frac{x^3}{\sqrt{x^2+1}}\mathrm{d}x$$

(d)(Sec7.4.PartialFraction.)

$$\int_0^2 \frac{10}{x^2-4x-21}\mathrm{d}x$$

Sec7.8. Improper Integral. LecNote6.

Q9 Determine whether the improper integral is convergent or divergent. Evaluate the integral if it is convergent.

(a)

$$\int_0^2 \frac{1}{(x-1)^2}\mathrm{d}x$$

(b)

$$\int_4^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}}\mathrm{d}x$$