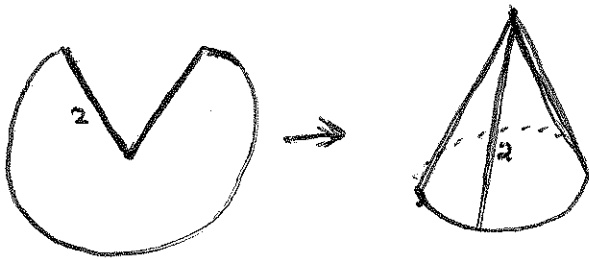


Practice test 3

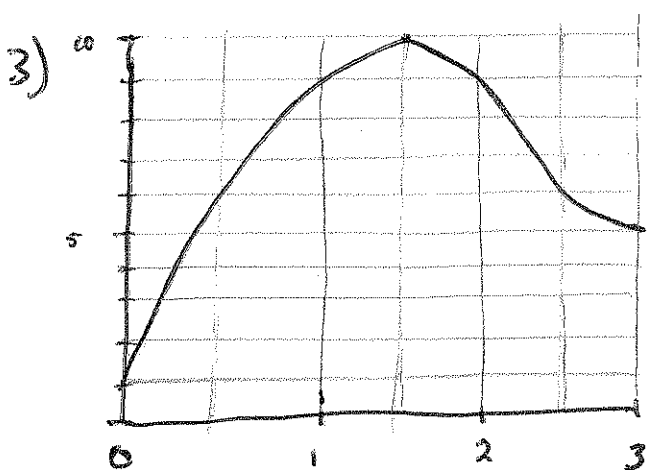
1) a) A rectangular container is supposed to have a volume of 10 m^3 . The length of the base is twice the width. Material for the base is $10 \$$ per square meter. Material for the sides and top are $6 \$$ per square meter. Find the cost of the cheapest container.

b) A cone shaped drinking cup is made from a circular piece of paper of radius 2, by cutting out a sector, and joining the edges. Find the maximum capacity of such a cup.



2) a) find $f(x)$, if $f'(x) = 1 - 6x$, $f(0) = 8$.

b) find $g(x)$, if $g''(x) = \sin(x) + \cos(x)$, $g'(0) = 4$, $g(0) = 3$



Estimate the area under the curve using

- 3 rectangles and Right endpoints
- 3 rectangles and Midpoints
- 6 Rectangles and Upper estimates
- 6 Rectangles and Left endpoints
- 2 rectangles and Right endpoints

4) for $f(x) = x^2 + x$ on $[1, 5]$,

Estimate $\int_1^5 f(x) dx$ using

a) 4 rectangles and Right endpoints.

b) 4 rectangles and Midpoints.

c) 8 rectangles and Right endpoints.

d) Write the Limit-Sum definition for $\int_1^5 x^2 + x dx$ with right-hand endpoints.

5) Do the same as exercise 4, with

$g(x) = e^x$ on $[0, 16]$. (estimate $\int_0^{16} e^x dx$).

6) Evaluate

a) $\frac{d}{dr} \left[\int_5^r 2x e^{x^2} dx \right]$

b) $\frac{d}{dx} \left[\int_{x^3}^5 2 \cos(t) \sin(t) dt \right]$

c) $\int_2^{10} \left(\frac{d}{dx} [x^3 + 25x - \pi] \right) dx$

d) $\int_{-\pi}^{\pi} e^{-x^2} dx$

e) $\int_{-2}^2 \sqrt{4-x^2} dx$

(Hint, $y = \sqrt{4-x^2}$ is the upper half of a circle, radius 2)

7) Evaluate The indefinite integrals.

a) $\int x^2 - x^{-2} dx$

b) $\int \csc^2(t) - 2e^t dt$

c) $\int \sec(x)(\sec(x) + \tan(x)) dx$

d) $\int x^2 + 1 + \frac{1}{x^2 + 1}$

e) $\int \frac{x^3 - 2\sqrt{x}}{x} dx$

f) $\int (3x - 2)^{20} dx$

g) $\int \frac{x}{(x^2 + 1)^2} dx$

h) $\int e^x \sin(e^x) dx$

i) $\int e^{\tan(x)} \sec^2(x) dx$

j) $\int \frac{e^x}{e^x + 1} dx$

8) Evaluate The definite integrals.

a) $\int_1^2 \frac{3}{t^4} dt$

b) $\int_{\pi}^{2\pi} \cos(x) dx$

c) $\int_1^9 \frac{1}{2x} dx$

d) $\int_1^2 (1 + 2y)^2 dy$

e) $\int_0^{\sqrt{\pi}} x \cos(x^2) dx$

f) $\int_0^2 (x-1)^{25} dx$

g) $\int_0^1 x e^{-x^2} dx$

h) $\int_0^{13} \frac{dx}{\sqrt[3]{(1+2x)^2}}$

9) a) If water leaks from a tank at a rate of $r(t)$ gallons per minute, what does $\int_{60}^{120} r(t) dt$ describe?

b) If $w'(t)$ is the growth rate of a child in pounds per year, what does $\int_5^{10} w'(t) dt$ describe?

c) A population is increasing at a rate of $200 + 5t$ members per year. How much does the population increase between the 4th and 10th years?

