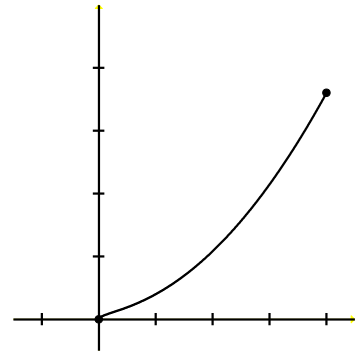1) Find the integral below. (8 points)
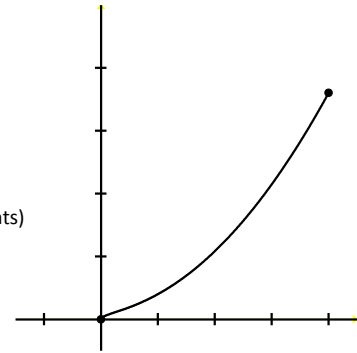
$$\int 4x \cos(4x^2 + 3)\, dx$$

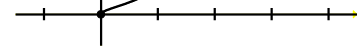2) Find the integral below. (8 points)

$$\int \frac{1}{10x - 3}\, dx$$

3) Illustrate (do not calculate) the area under the curve given below. (2 points)

4) Illustrate (do not calculate) an approximation to the area under the curve given below. (2 points)
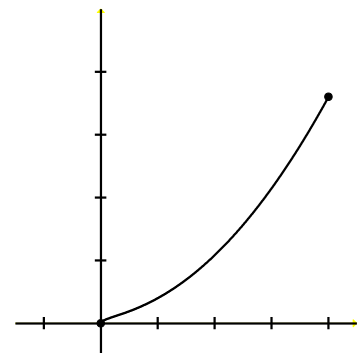
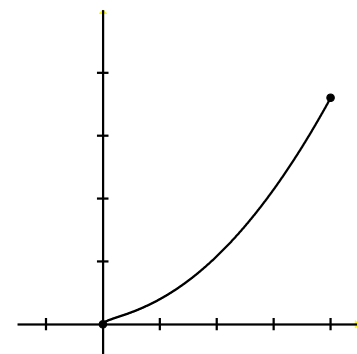5) Calculate the approximation you illustrated in the previous question. (2 points)

6) Is your approximation above an overestimate or an underestimate? (1 point)

7) Illustrate a better approximation than you came up with. (2 points)

8) Illustrate an even better approximation than you came up with in the previous question. (1 points)

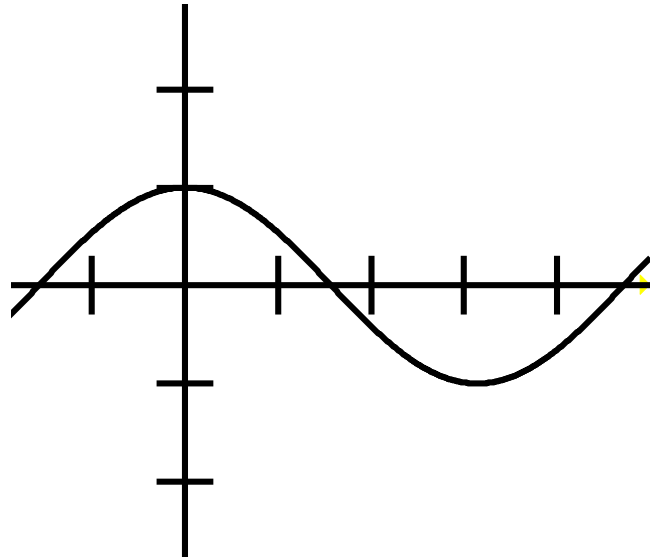9) Find the integral below. (8 points)

$$\int_0^1 2x(4 - x^2)dx$$

10) Find the integral below. (8 points)

$$\int_0^{\ln(4)} \frac{e^x}{3 + 2e^x}dx$$

11) The curve $y = \cos(x)$ is shown to the right. The region bounded by this curve, $x = 0$, and $y = 0$ is to be rotated around the x-axis.

(a) Shade the region described. (1 point)

(b) Describe the 3-dimensional shape in words. (3 points)

(c) Set up, but do not evaluate, the integral for the volume of the solid created. Indicate your method. (6 points)

(Disk/washer)   (Cylindrical Shell)

12) The curve $y = \cos(x)$ is shown to the right. The region bounded by this curve, $x = \frac{\pi}{2}$, $x = \frac{3\pi}{2}$, and $y = 0$ is to be rotated around the y-axis.

(a) Shade the region described. (2 points)

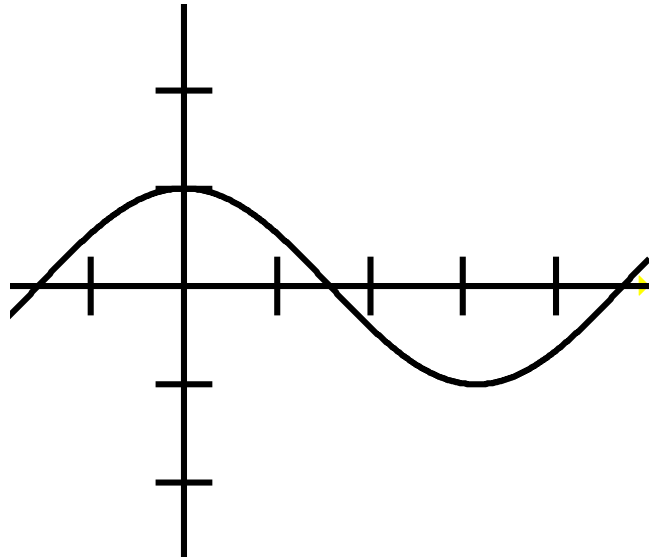(b) Describe the 3-dimensional region in words. (3 points)

(c) Set up, but do not evaluate, the integral for the volume of the solid created. Indicate your method. (6 points)

(Disk/washer)   (Cylindrical Shell)

Consider the velocity function shown below of an object moving along a line. Assume time is measured in seconds and distance is measured in meters. The area of four regions bounded by the velocity curve and the t-axis are also given.

13) On what intervals is the objet moving in the negative direction? (4 points)

14) What is the displacement of the object over the interval $[2,6]$? (4 points)
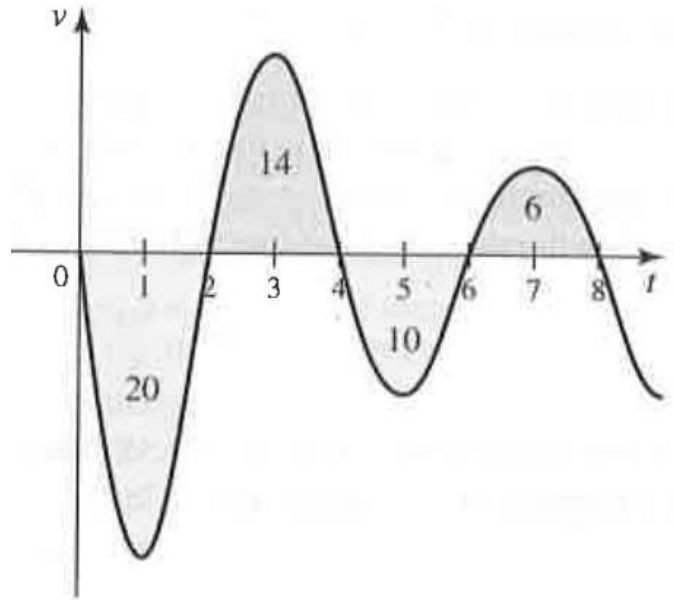

15) How far does the object travel over the interval $[0,6]$? (4 points)

16) Describe the position of the object relative to its initial position after 8 seconds. (4 points)

An automobile is moving along a straight highway over a two-hour period. A table of velocities at certain times is given below. Below is a table of values of a function.

$t\ (hr)$	0	0.5	1	1.5	2
$v\ (mi/hr)$	20	25	30	35	35

17) Sketch a smooth curve passing through the data points. (3 points)
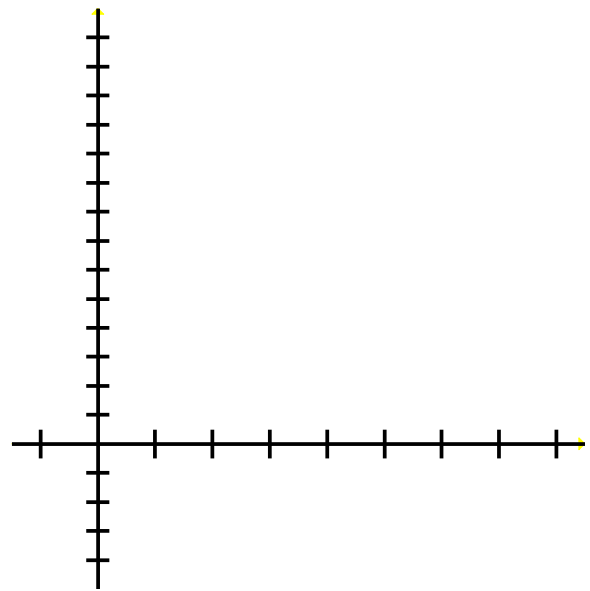
18) Approximate, as closely as you can, the total distance travelled. If you cannot find the exact distance, find an overestimate. (6 points)

19) Find each of the integrals below. (4 points each)

$$\int 3x^2 + 2x + 1 \, dx$$

$$\int \sin(2x) \, dx$$

$$\int 3^5 \, dx$$