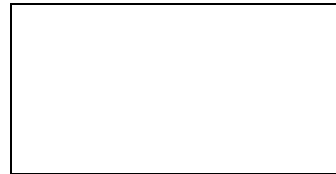


Solve each of the following problems. Use the available space to **show all work**.

1. $\int_0^3 (3x^2 - 5) dx$



2. Find the equation of the tangent line to the curve $y = -x^3 + 8x$ at $x = 1$.



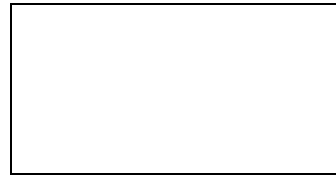
3. At what value(s) of x does $f(x) = x^4 - 60x^2$ have a relative minimum?

4. Find the average value of the function $f(x) = 29 \sin^2 x \cos x$ on the interval $\left[0, \frac{3\pi}{2}\right]$.

5. On what interval(s) is the function $f(x) = x^3 - 19x^2 - 17x + 5$ decreasing?



6. If $x + y = x^2y$, find $\frac{dy}{dx}$.

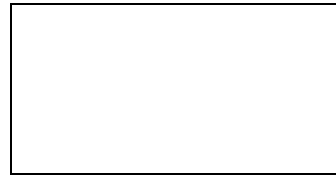


7. Evaluate the limit:

$$\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3}$$



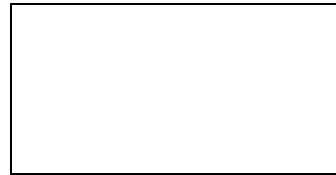
8. Let f be the function given by $f(x) = x^5$. What are all the values of x that satisfy the conclusion of the Mean Value Theorem on the interval $[-2, 3]$?



9. The velocity of a particle moving in a straight line is given by $v(t) = 4t - 7$. What is the position function $p(t)$ for the particle at time t if $p(3) = 17$?



10. On what interval(s) is the function $f(x) = 0.05x^4 - 3x^2 - 5x$ concave up?



11. Find all values of x that are critical values for the function $f(x) = \frac{\sin x}{x}$ on the interval $[-6, 2]$.

12. Evaluate the limit:

$$\lim_{x \rightarrow 1^+} \frac{5}{x-1}$$

13.

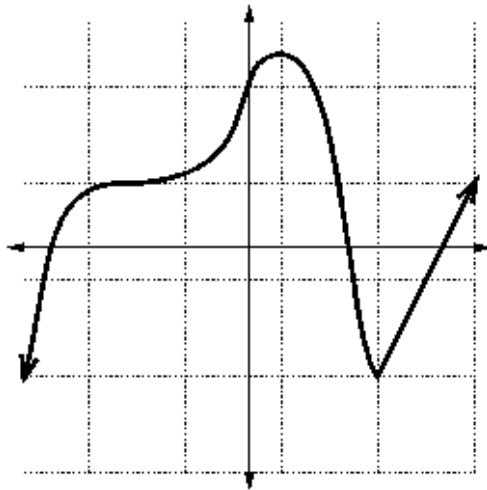
x	0	1	2	3	4
$f(x)$	-1	4	7	3	1



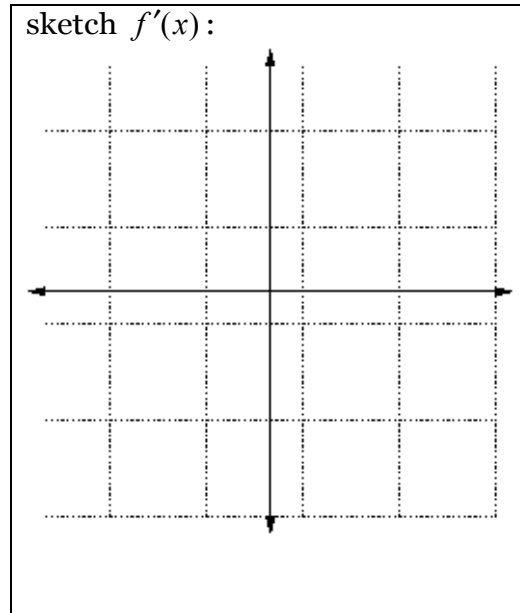
For the function whose values are given in the table above, $\int_0^4 f(x)dx$ is approximated by a Riemann Sum using the value at the right edge of each of four intervals of width 1. Compute the value of the approximation.

14

Given the sketch of $f(x)$...



sketch $f'(x)$:



15. Given $f(x) = -2x^6 + 7x^2 - \sqrt{x}$, find $f''(6)$.

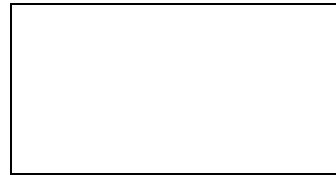
16. $\int \frac{x}{\sqrt{x-1}} dx$

17. Evaluate the limit:

$$\lim_{x \rightarrow 0} \frac{e^{7x} - 1}{x}$$



18. An automobile moves at a velocity of $15t^{1/4}$ miles per hour with $t > 0$ measured in hours. How far has the automobile traveled when 5 hours have elapsed?



19.

$$\int x \sin x \, dx$$

20.

If $y = 3xe^{-x}$, then y has an inflection point at what value of x ?

21.

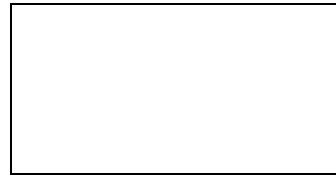
Formula for volume of sphere: $V = \frac{4}{3}\pi r^3$

If the radius of a sphere is increasing at the rate of 3.5 meters per second, how fast (in cubic meters per second) is the volume increasing when the radius is 4 meters?



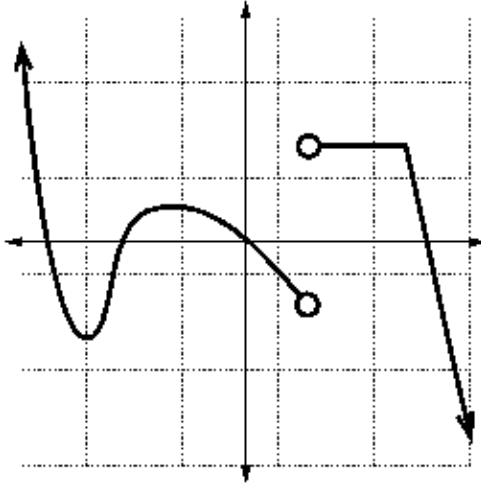
22.

If $f(x) = \tan(3x^4 - 5x)$, find $f'(x)$.

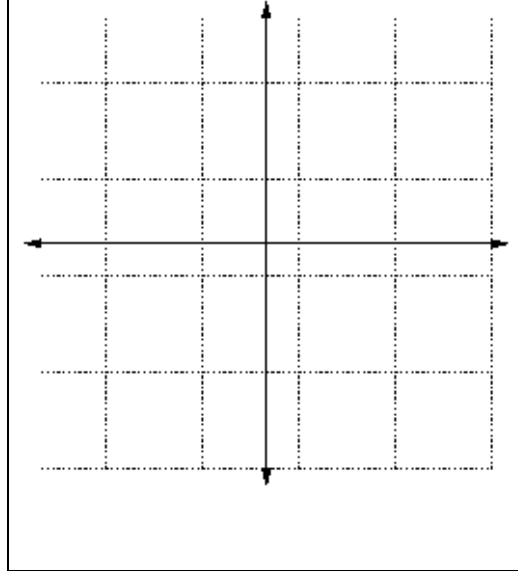


23

Given the sketch of $g'(x)$...



sketch $g(x)$:



24.

Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function:

$$g(x) = \int_0^x \sqrt{\tan z + z} dz$$



25. Find the area of the region enclosed by the given curves:

$$y = 2x + 3$$

$$y = -x^2$$

$$x = -2$$

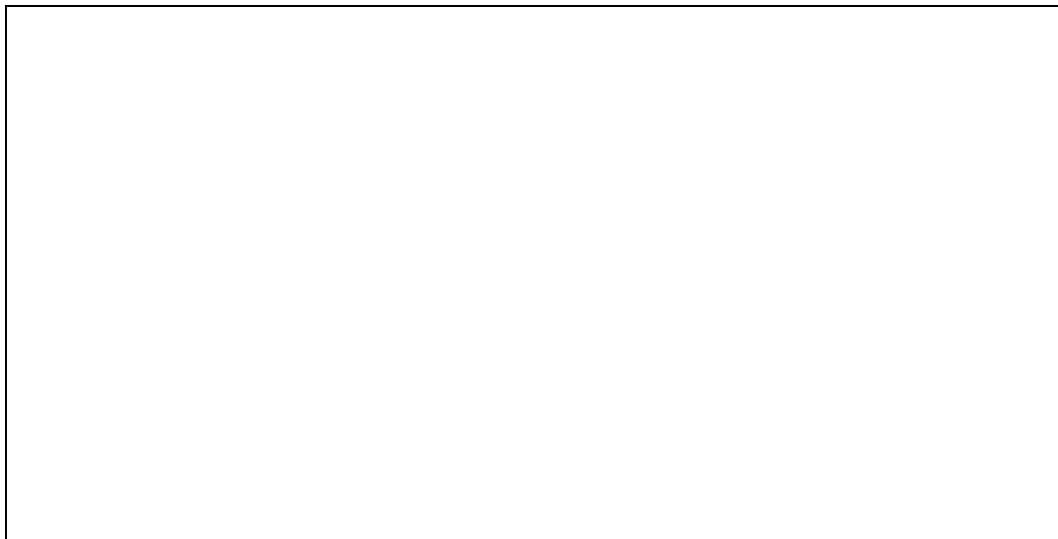
$$x = 1$$



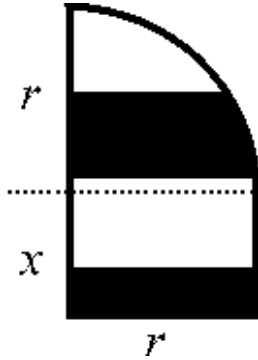
26. Use the Squeeze Theorem to show that

$$\lim_{x \rightarrow 0} x^4 \cos \frac{\pi}{x} = 0$$

Illustrate using $f(x) = x^4$ and $h(x) = -x^4$ as the squeezing functions.



27. The shape below is created by placing a quarter circle atop a rectangle. It has an outer perimeter of 40 cm (bold line). Find the dimensions r and x that maximize the area of the shape.



28. Find the volume of the solid created by revolving about the x -axis the region enclosed by the given curves.

$$y = x^4 + 5$$

$$y = x^2 + 3$$

$$x = -1$$

$$x = 2$$

