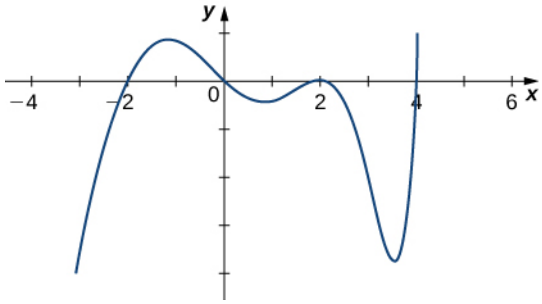
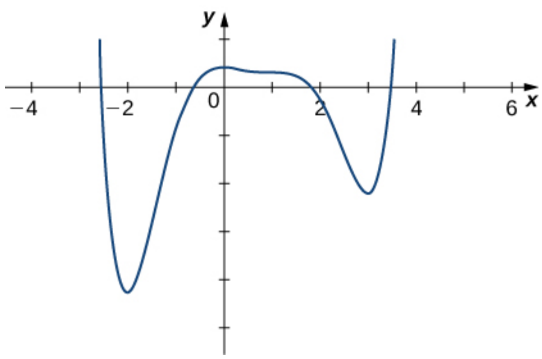
529. Given the graph of f', determine where f is increasing or decreasing.



530. The graph of f is given below. Draw f'.



531. Find the linear approximation $L(x)$ to $y = x^2 + \tan(\pi x)$ near $x = \frac{1}{4}$.

532. Find the differential of $y = x^2 - 5x - 6$ and evaluate for $x = 2$ with $dx = 0.1$.

Find the critical points and the local and absolute extrema of the following functions on the given interval.

533. $f(x) = x + \sin^2(x)$ over $[0, \pi]$

534. $f(x) = 3x^4 - 4x^3 - 12x^2 + 6$ over $[-3, 3]$

Determine over which intervals the following functions are increasing, decreasing, concave up, and concave down.

535. $x(t) = 3t^4 - 8t^3 - 18t^2$

536. $y = x + \sin(\pi x)$

537. $g(x) = x - \sqrt{x}$

538. $f(\theta) = \sin(3\theta)$

Evaluate the following limits.

539. $\lim_{x \to \infty} \frac{3x\sqrt{x^2 + 1}}{\sqrt{x^4 - 1}}$

540. $\lim_{x \to \infty} \cos\left(\frac{1}{x}\right)$

541. $\lim_{x \to 1} \frac{x - 1}{\sin(\pi x)}$

542. $\lim_{x \to \infty} (3x)^{1/x}$

Use Newton's method to find the first two iterations, given the starting point.

543. $y = x^3 + 1,\ x_0 = 0.5$

544. $\frac{1}{x + 1} = \frac{1}{2},\ x_0 = 0$

Find the antiderivatives $F(x)$ of the following functions.

545. $g(x) = \sqrt{x} - \frac{1}{x^2}$

546. $f(x) = 2x + 6\cos x,\ F(\pi) = \pi^2 + 2$

Graph the following functions by hand. Make sure to label the inflection points, critical points, zeros, and asymptotes.

547. $y = \frac{1}{x(x + 1)^2}$

548. $y = x - \sqrt{4 - x^2}$

549. A car is being compacted into a rectangular solid. The volume is decreasing at a rate of $2\ \text{m}^3/\text{sec}$. The length and width of the compactor are square, but the height is not the same length as the length and width. If the length and width walls move toward each other at a rate of $0.25\ \text{m/sec}$, find the rate at which the height is changing when the length and width are $2\ \text{m}$ and the height is $1.5\ \text{m}$.