

6. Let f be the function whose graph goes through the point $(3, 6)$ and whose derivative is given by $f'(x) = \frac{1 + e^x}{x^2}$.
- (a) Write an equation of the line tangent to the graph of f at $x = 3$ and use it to approximate $f(3.1)$.

x	-1.5	-1.0	-0.5	0	0.5	1.0	1.5
$f(x)$	-1	-4	-6	-7	-6	-4	-1
$f'(x)$	-7	-5	-3	0	3	5	7

Let f be a function that is differentiable for all real numbers. The table above gives the values of f and its derivative f' for selected points x in the closed interval $-1.5 \leq x \leq 1.5$. The second derivative of f has the property that $f''(x) > 0$ for $-1.5 \leq x \leq 1.5$.

- (a) Evaluate $\int_0^{1.5} (3f'(x) + 4) dx$. Show the work that leads to your answer.
- (b) Write an equation of the line tangent to the graph of f at the point where $x = 1$. Use this line to approximate the value of $f(1.2)$. Is this approximation greater than or less than the actual value of $f(1.2)$? Give a reason for your answer.

4. Let f be a function with $f(1) = 4$ such that for all points (x, y) on the graph of f the slope is given by $\frac{3x^2 + 1}{2y}$.

- (a) Find the slope of the graph of f at the point where $x = 1$.
- (b) Write an equation for the line tangent to the graph of f at $x = 1$ and use it to approximate $f(1.2)$.

x	-1.5	-1.0	-0.5	0	0.5	1.0	1.5
$f(x)$	-1	-4	-6	-7	-6	-4	-1
$f'(x)$	-7	-5	-3	0	3	5	7

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- (b) Write an equation of the line tangent to the graph of f at the point where $x = 1$. Use this line to approximate the value of $f(1.2)$. Is this approximation greater than or less than the actual value of $f(1.2)$? Give a reason for your answer.

Linear Approximations

78, 92. Let f be the function given by $f(x) = x^2 - 2x + 3$. The tangent line to the graph of f at $x = 2$ is used to approximate values of $f(x)$. Which of the following is the greatest value of x for which the error resulting from this tangent line approximation is less than 0.5?

- (A) 2.4 (B) 2.5 (C) 2.6 (D) 2.7 (E) 2.8

69 36. The approximate value of $y = \sqrt{4 + \sin x}$ at $x = 0.12$, obtained from the tangent to the graph at $x = 0$, is

- (A) 2.00 (B) 2.03 (C) 2.06 (D) 2.12 (E) 2.24

69 37. Which is the best of the following polynomial approximations to $\cos 2x$ near $x = 0$?

- (A) $1 + \frac{x}{2}$ (B) $1 + x$ (C) $1 - \frac{x^2}{2}$ (D) $1 - 2x^2$ (E) $1 - 2x + x^2$

97 14. Let f be a differentiable function such that $f(3) = 2$ and $f'(3) = 5$. If the tangent line to the graph of f at $x = 3$ is used to find an approximation to a zero of f , that approximation is

- (A) 0.4 (B) 0.5 (C) 2.6 (D) 3.4 (E) 5.5

93 45. If Newton's method is used to approximate the real root of $x^3 + x - 1 = 0$, then a first approximation $x_1 = 1$ would lead to a third approximation of $x_3 =$

- (A) 0.682 (B) 0.686 (C) 0.694 (D) 0.750 (E) 1.637

93
8c

25. Consider the curve in the xy -plane represented by $x = e^t$ and $y = te^{-t}$ for $t \geq 0$. The slope of the line tangent to the curve at the point where $x = 3$ is

- (A) 20.086 (B) 0.342 (C) -0.005 (D) -0.011 (E) -0.033

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44. For small values of h , the function $\sqrt[4]{16+h}$ is best approximated by which of the following?

- (A) $4 + \frac{h}{32}$ (B) $2 + \frac{h}{32}$ (C) $\frac{h}{32}$
(D) $4 - \frac{h}{32}$ (E) $2 - \frac{h}{32}$