

AP Calculus

Linear Approximation

Use linear approximation at $x = 2$ to estimate the value of $f(a)$ for the given function. Then, state if the approximation is an overestimate or an underestimate and explain.

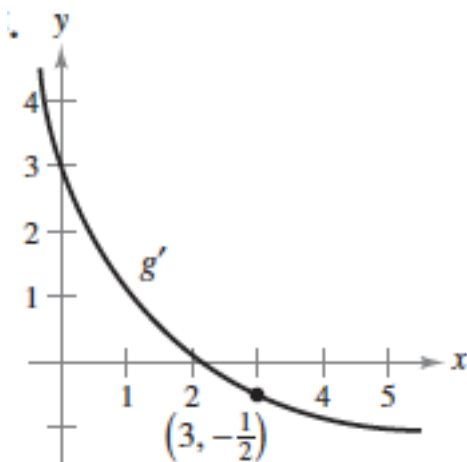
1. $f(x) = \frac{6}{x^2}$; $a = 1.9$
2. $f(x) = x^5$; $a = 2.1$
3. $f(x) = \sqrt{x+7}$; $a = 1.99$

Estimate the value of the expression using linear approximation.

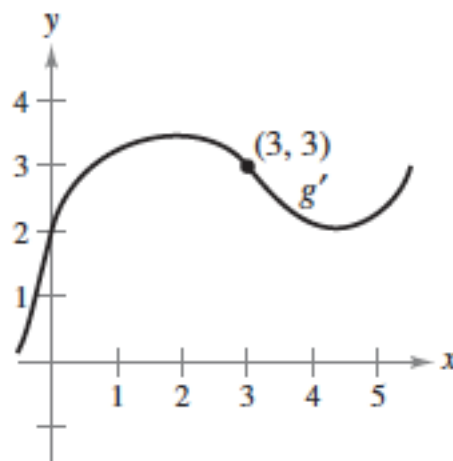
4. $\sqrt{63.9}$
5. $\sqrt[3]{-65}$
6. $(-2.98)^3$

Using the graph of g' , approximate $g(2.93)$ and $g(3.1)$ given that $g(3) = 8$.
Is the approximation an underestimate or overestimate? Explain.

7.



8.



Answers

- 1 $1\frac{13}{20} = 1.65$ underestimate since $f(x)$ is concave up at $x = 2$
- 2 40 underestimate since $f(x)$ is concave up at $x = 2$
- 3 $2\frac{599}{600}$ overestimate since $f(x)$ is concave down at $x = 2$
- 4 $7\frac{159}{160}$
- 5 $-4\frac{1}{48}$
- 6 $-26\frac{23}{50} = -26.46$
- 7 $g(2.93) = 8\frac{7}{200} = 8.035$; overestimate since g' is decreasing (g is concave down at $x = 3$)
 $g(3.1) = 7\frac{19}{20} = 7.95$
- 8 $g(2.93) = 7\frac{79}{100} = 7.79$; overestimate since g' is decreasing (g is concave down at $x = 3$)
 $g(3.1) = 8\frac{3}{10} = 8.3$