Exam 3 review

MAT 201, Spring 2017

Estimate each value with linear approximation. Use a fraction of whole numbers for your estimate.

1. $\sqrt[3]{7}$
2. $\dfrac{1}{\sqrt{39}}$
3. $\arctan 0.15$

4. Determine if the mean value theorem applies to the function

$$g(x) = \frac{x}{x^2 - 4}$$

on the interval $[0, 5]$. If so, give the point on the graph whose existence is guaranteed by the theorem.

5. Determine if the mean value theorem applies to the function

$$g(x) = \frac{10}{x + 4}$$

on the interval $[0, 5]$. If so, give the point on the graph whose existence is guaranteed by the theorem.

Evaluate each limit using L'Hopital's rule.

6. $\lim\limits_{x \to 0} \dfrac{e^x - 1 - x}{x^2}$
7. $\lim\limits_{x \to \infty} x^3 e^{-x^2}$
8. $\lim\limits_{x \to \pi/2^-} (\sec x - \tan x)$
9. $\lim\limits_{x \to 0} (1 - 2x)^{1/x}$

Find each indefinite integral.

10. $\displaystyle\int 5x^2 \, dx$
11. $\displaystyle\int \left(\sin x + \frac{1}{x} \right) dx$
12. $\displaystyle\int \left(5\cos(3x) + \frac{2x^5 - \sqrt{x}}{x} \right) dx$

13. Find $f(x)$ if

$$f'(x) = e^{2x} + \frac{20}{x^2 + 1}.$$

14. An experimental aircraft moves with acceleration

$$a(t) = 6t + 4$$

measured in m/s^2. Here t denotes time in seconds after the experiment begins. We also know that the initial velocity of the aircraft is $v(0) = 6$ m/s, and its initial position is $h(0) = 9$ m. Find functions for the velocity and position of the aircraft at time t.