

Mesa College – Math 121 (Applied Calculus I) Sample Questions

Directions for actual test: You may use a scientific calculator for arithmetic operations. Write neatly, show your work and steps. Label your work so it's easy to follow. Answers without appropriate work will receive NO credit. Be sure to simplify all radicals and fractions. Attach your neat and organized solutions behind this cover sheet.

1. Find the $\lim_{x \rightarrow 3} \frac{(x-3)^2 + 3x - 9}{2x - 6}$

2. Given the function $f(x) = 4x^2 - 3x + 2$, find $f'(x)$ using $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

3. Find the derivatives of the following functions:

a. $f(x) = (2x^3 - 4x) \cdot \sqrt[3]{x}$ (hint: multiply first)

b. $f(x) = \frac{2x^2 - 5}{x - 3}$

c. $f(x) = x^3 e^{0.04x}$ (hint: product rule)

d. $f(x) = x^2 \ln(x)$
(hint: product rule)

4. Find y' if $y = \sqrt[4]{3x^2 - 5}$

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

6. Sketch the graph of $f(x) = x^3 - 5x^2 - 6x$. Find the y-intercept and x-intercepts. Label all local maxima, all local minima and inflection points.

7. The marginal cost of a company is $C'(x) = \frac{1}{\sqrt{2x+4}}$ where x is the number of items and $C(0) = 100$. Find the cost of the first 4 items to the nearest cent.

8. Find the integrals:

a. $\int_1^3 (4x^2 + 5x + 1) dx$

b. $\int (2x + 1)(3x - 5) dx$

c. $\int 6xe^{x^2+4} dx$

d. $\int 2x\sqrt{2x^2 + 1} dx$

9. Find the area of the region between the graphs of $f(x) = 2 - x^2$ and $g(x) = x$

a. Sketch a graph of both functions

b. Find the area of the region bounded by the graphs.

10 Given $f(x, y) = 2x^3 - 5xy^2 - 3x$ find $f_x(x, y)$, $f_y(x, y)$, $f_{xy}(x, y)$ and $f_{yy}(x, y)$

Answers: 1. $3/2$ 2. $8x - 3$ 3a. $\frac{20}{3}x^{7/3} - \frac{16}{3}x^{4/3}$ 3b. $\frac{2x^2 - 12x + 5}{(x-3)^2}$ 3c. $e^{0.04x}(3x^2 + 0.04x^3)$

3d. $2x \ln x + x$ 4. $\frac{3}{2}x(3x^2 - 5)^{-3/4}$ 5. $\frac{2x - y^2}{2xy + 2}$

6. y-intercept (0, 0)

Local maxima (-0.519, 1.62)

Local minima (3.85, -40.14)

Inflection points (5/3, -19.26)

7. \$101.46 8a. $170/3$ 8b. $2x^3 - \frac{7}{2}x^2 - 5x + c$ 8c. $3e^{x^2+4}$ 8d. $\frac{1}{3}(2x^2 + 1)^{3/2}$

9. 4.5

10. $f_x = 6x^2 - 5xy^2 - 3$ $f_y = -10xy$ $f_{xy} = -10xy$ $f_{yy} = -10x$