

## Math 1241: Review for Final Exam

**This review is not intended to be all-inclusive and should not be considered to be a practice test. You should also review your previous exams and other materials in preparation for the final exam.**

- Find the equation of the line which passes through the point (3, -2) and a) is parallel to  $y = 4x - 5$ , b) is perpendicular to  $y = 4x - 5$ , c) is horizontal
- $\lim_{x \rightarrow -3} (x^2 + x - 1)$       3.  $\lim_{x \rightarrow 1} \left( \frac{x-1}{x^2-1} \right)$       4.  $\lim_{x \rightarrow \infty} \left( \frac{3x-5}{2x+1} \right)$
- Find  $f'(x)$  for each of the following:
  - $f(x) = 4x^5 - 7x^2 + 5$
  - $f(x) = \ln(2x + 3)$
  - $y = \frac{x-4}{2x+5}$
  - $f(x) = e^{x^2-4x+3}$
  - $y = e^x(4x-1)^3$
  - $f(x) = \sqrt{x^2-8x}$
  - $y = \frac{3}{\sqrt{x}}$
- Find the slope of the tangent to the graph of  $f(x) = x^3 - 4x^2 + 3x - 2$  where  $x = 1$
- Use the derivative to find all relative extrema that exist for each of the following, and intervals where each is increasing and decreasing.
  - $f(x) = 4x^3 + 2$
  - $y = 2x^3 + 6x^2 - 1$
- Find the average rate of change of  $f(x) = x^2 - 8x + 4$  on the interval from  $x = 2$  to  $x = 4$
- Find the instantaneous rate of change of  $f(x) = x^2 - 8x + 4$  at  $x = 2$
- Find the second derivative for each of the following:
  - $f(x) = 9x^3 + 5x^2 + 7x - 1$
  - $y = \frac{x+1}{x-5}$
  - $y = e^{4x}$
  - $f(x) = \sqrt{x}$
- Locate any inflection points for  $f(x) = (x + 5)^3 + 2$
- Find the equation of the tangent to the graph of  $f(x) = 2x^2 - 3x + 5$  at the point (1, 4).
- If the demand equation for a product is  $p = -0.01x^2 - 0.2x + 8$  where  $p$  is the price and  $x$  is the daily demand, find the marginal revenue function.
- Find  $f(x) = \int \left( x^3 - 3e^x + \frac{2}{x} - \frac{5}{x^3} \right) dx$
- Evaluate  $\int_1^4 (3x^2 + 1) dx$
- Find the area under the graph of  $f(x) = x^2 + 2$  on the interval [1, 3]

**Answers:**

1. a)  $y = 4x - 14$     b)  $y = -\frac{1}{4}x - \frac{5}{4}$     c)  $y = -2$

2. 5

3.  $\frac{1}{2}$

4.  $\frac{3}{2}$

5. a)  $f'(x) = 20x^4 - 14x$     b)  $f'(x) = \frac{2}{2x+3}$     c)  $y' = 13/(2x+5)^2$

d)  $f'(x) = (2x-4)e^{x^2-4x+3}$     e)  $y' = e^x(4x-1)^2(4x+11)$     f)  $f'(x) = \frac{x-4}{(x^2-8x)^{1/2}}$

g)  $y' = -\frac{3}{2}x^{-3/2}$     21. a) Rel. Max = 5.0833 at  $x = 7/6$ , Incr. Decr.

6.  $m = -2$

7. a) Always Incr., No Rel. Extrema

b) Incr. for  $x < -2$  &  $x > 0$ , Decr. for  $-2 < x < 0$ , Rel. Max = 7 at  $x = -2$ , Rel. Min = -1 at  $x = 0$

8. -2

9. -4

10. a)  $f''(x) = 54x + 10$     b)  $y'' = \frac{12}{(x-5)^3}$     c)  $y'' = 16e^{4x}$     d)  $f''(x) = -\frac{1}{4}x^{-3/2}$

11. (-5, 2)

12.  $y = x + 3$

13.  $R'(x) = -0.03x^2 - 0.4x + 8$

14.  $\frac{1}{4}x^4 - 3e^x + 2\ln|x| + \frac{5}{2x^2} + C$

15. 66

16.  $\frac{38}{3}$