

## MATH 183 Final (DD)

Show all work for full credit!

In problems where you are only asked to find the derivative of a function, you do not have to simplify your answers completely.

All problems are worth 5 points each.

1) Find  $\int (28x^{-7/2} + 3e^{21x} - 14) dx$

2) Find the equation of the line tangent to  $g(x) = (3x + 5)^{4/3} \ln x$  at  $x = 1$

3) Evaluate:  $\lim_{x \rightarrow 2} \frac{3x^2 - 48x + 84}{x^3 + 2x^2 - 8x}$

4) Find all critical points of  $f(x) = -2x^5 + 15x^4 + 90x^3$  and classify each as a relative minimum, relative maximum, or neither one.

5) An open-topped box is to be made by cutting a square from each corner of a 26-in. by 40-in. rectangular piece of cardboard and then folding up the sides. What size squares should be cut from each corner in order to maximize the volume of the box and what is the maximum volume of the box?

6) Find  $\int \frac{x^{14} - 3x^7 + 54}{9x^6} dx$

7) Find the average rate of change of  $h(x) = -x^5 + 6x^3 + 17$  between  $x = -3$  and  $x = 2$ .

8) Evaluate  $\int_4^{16} \left( \frac{\sqrt{x}}{2} + \frac{12}{\sqrt{x}} \right) dx$

9) Find the area beneath the curve  $g(x) = 3x + 2\sqrt[3]{x}$  from  $x = 8$  to  $x = 27$ .

10) Determine where the following function is continuous:  $f(x) = \frac{250 - 2x^3}{4x^3 - 196x}$

- 11) Find the area enclosed by the curves  $f(x) = x^5$  and  $g(x) = 8x^2$ .
- 12) Find the absolute maximum and minimum values of  $f(x) = 2x^4 + 8x^3 - 112x^2$  on the interval  $[-2, 5]$ .
- 13) Find  $g'(t)$  for  $g(t) = \frac{(3 + 6e^{8t})^{14}}{(\sqrt[3]{t^7} - \ln t)^{52}}$ .
- 14) Find the intervals where  $g(x) = x^4 + 6x^3 - 35x^2 - 250$  is increasing and the intervals where it is decreasing.
- 15) Find the instantaneous rate of change of  $f(x) = \frac{x^4 - 3x}{x^2 + 5}$  at  $x = 2$ .
- 16) Find the area enclosed by the curves  $x = -1$ ,  $x = 2$ ,  $y = 2x^2 - 189$ , and  $y = 10x + 163$ .
- 17) Find  $h'(x)$  for  $h(x) = 5e^{2x^4 - 7x^3 + x} - 9\ln(x^{14} - x + e^x)$
- 18) Find  $f(x)$  given that  $f'(x) = 12x^3 - 6x^2 - 7x + 41$  and  $f(2) = 38$ .
- 19) Find the intervals where  $h(x) = -\frac{3}{2}x^4 + 24x^3 - 108x^2 + 270x - 48$  is concave up and concave down.
- 20) Evaluate  $\int_1^3 (16x - 42x^{-2}) dx$