

## MATH 141 PRETEST 2

This test is designed to give an example of what types of questions may be on the test. Show all work for full credit.

1. Use the limit definition to find  $f'(x)$  for  $f(x) = 5x^2 - x + 7$ .

2. Find the derivative  $f'(x)$ .

$$f(x) = \csc x \sec(5x)$$

3. Find the derivative  $f'(x)$ .

$$f(x) = \left(x + \frac{1}{\sqrt{x}}\right) \left(\frac{3x+1}{x^2-1}\right)$$

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4. Find the derivative  $f'(x)$ .

$$f(x) = \sin(4x) \cot(3x)$$

5. Find the derivative  $f'(x)$ .

$$f(x) = \left( \frac{x^2 + 1}{3x^3 + x} \right)^4$$

6. Find the derivative  $f'(x)$ .

$$f(x) = \sin(\sec(\cos(x^2)))$$

7. Find the derivative  $f'(x)$ .

$$f(x) = \sqrt{\cos^3(4x) + \sin(x^2)}$$

8. Find the derivative  $f'(x)$ .

$$f(x) = \sqrt[4]{\ln(x^2)} + 5^x$$

9. Find the derivative  $f'(x)$ .

$$f(x) = \ln(\cos^2(3x))$$

10. Find the derivative  $f'(x)$ .

$$f(x) = xe^{\sin(3x)}$$

11. Find the derivative  $f'(x)$ .

$$f(x) = 2^{x \tan(4x)}$$

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12. Find the derivative  $f'(x)$ .

$$f(x) = \frac{1}{\cos^2(3x)} + \ln 5$$

13. Find the derivative  $f'(x)$ .

$$f(x) = x \sin^{-1}(5x^2)$$

14. Find the derivative  $f'(x)$ .

$$f(x) = \tan^{-1}(\sin^2(x^2))$$

15. Find the derivative  $f'(x)$ .

$$\frac{e^{3x}(x^3 + 5)^4}{(7x^2 + x - 2)^6}$$

16. Find the derivative  $f'(x)$  using logarithmic differentiation.

$$f(x) = \cos(2x)^{\sin x}$$

17. Find the derivative  $f'(x)$  using logarithmic differentiation.

$$f(x) = (3x^2 + \cos x)^{\tan(x^5)}$$

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18. Find  $\frac{dy}{dx}$  if the following equation holds.

$$x^3(y + 2)^2 + \sin(xy) = 2$$

19. Find  $\frac{dy}{dx}$  if the following equation holds.

$$ye^x - x^2 \ln(xy) = 4$$

**20.** A 20 meter ladder rests vertically against the side of a barn. A pig that has been attached to the ladder starts to pull the base of the ladder away from the wall at a constant rate of .4 meters per second. Find the rate of change of the top of the ladder after 30 seconds.

**21.** A spherical balloon is being inflated at a rate of 10 cubic meters per hour. How fast is its radius increasing when the radius of the balloon is 5 meters.  
(Volume of a sphere:  $V = \frac{4}{3}\pi r^3$ .)

**22.** Two cars start moving from the same point. One travels south at 60 mph and the other travels west at 25 mph. At what rate is the distance between the cars increasing two hours later?

**23.** A water tank has the shape of an inverted circular cone with base radius 2 m and height 4 m. If water is being pumped into the tank at a rate of  $2 \text{ m}^3/\text{min}$ , find the rate at which the water level is rising when the water is 3 m deep.  
(Volume of a cone:  $V = \frac{1}{3}\pi r^2 h$ .)

24. Evaluate the limit.

$$\lim_{x \rightarrow 1} \left( \frac{1}{\ln x} - \frac{1}{x-1} \right)$$

25. Evaluate the limit.

$$\lim_{x \rightarrow 2} \frac{(x-2) - \ln(x-1)}{(x-2)^2}$$

26. Evaluate the limit.

$$\lim_{x \rightarrow \infty} \left( \frac{x+2}{x} \right)^x$$