

MATH 211

Exam 1: Study guide

Question 1

Just like #15 and #18 on p. 127.

Question 2

Just like #21 p. 127.

Question 3

Just like #26 and #35 on p. 127.

Question 4

Just like #59 and 60 on p. 128. However, I also want you to be able to write the equation of the tangent line in both point-slope form and slope-intercept form. For these two forms, see Example 7 on p. 59.

So, let's say the question were to find the slope of the function $f(x) = x^3 - 4x^2 + 6$ at $x = 2$. Then the slope in general would be $f'(x) = 3x^2 - 8x$, and

$$f'(2) = 3(2)^2 - 8(2) = -4 \text{ at } x = 2.$$

Now, the point slope form symbolically would be $y - y_0 = m(x - x_0)$. Since $f(2) = (2)^3 - 4(2)^2 + 6 = -2$, then substituting values yields $y - (-2) = -4(x - 2)$. Next we solve the last equation for y to obtain $y = -4x + 6$ for slope-intercept form. Symbolically, the slope-intercept form is $y = mx + b$.

Question 5

Be able to do Example 3, Part (a), on p. 117. To receive full credit for this problem, you must clearly identify the coordinates of the two points that you found, then show the slope formula symbolically, and substitute into the slope formula the coordinates of these two points.

To see the slope form symbolically, look at p. 62 in the section entitled “Verification of Property 2.” But I will restate here the slope formula symbolically:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Question 6

Be able to find the second derivative of a function symbolically, and then be able to evaluate that second derivative for a particular input. As part of this question, I want you to be able to write down both notations for a derivative. See pp. 109-111.

Look at Example 6 on p. 403, or Exercises 5.1.93 to 5.1.96 on p. 407.

As an example, let’s say that the function were the following, as given in Example 3 on p. 111, and that I wanted you to evaluate the second derivative at $x = 3$:

$$f(x) = x^4 - 5x^3 + 7$$

For the symbolic portion of the answer, you would write down the following two responses:

$$f''(x) = 12x^2 - 30x$$

$$\frac{d^2}{dx^2} f(x) = 12x^2 - 30x$$

For the symbolic portion of the answer, you would write down the following two responses, and you may show as much intermediate work as you wish:

$$f''(3) = 12(3)^2 - 30(3) = 18$$

$$\left. \frac{d^2}{dx^2} f(x) \right|_{x=3} = 12(3)^2 - 30(3) = 18$$

Question 7

Be able to do Example 1, Part (b) on p. 109. As further practice, see #34 on p. 114.

Question 8

Be able to do Example 4, Part (a) and Part (b) on p. 119. But I will ask you one additional question, which is to determine the height of the ball after a certain number of seconds. So, for that problem, if I asked what is the height of the ball after 2 seconds, just evaluate the original function at $x = 2$. For this problem, therefore, you would find the height of the ball after 2 seconds in the following manner:

$$s(t) = -16t^2 + 128t + 5 = -16(2)^2 + 128(2) + 5 = 197$$