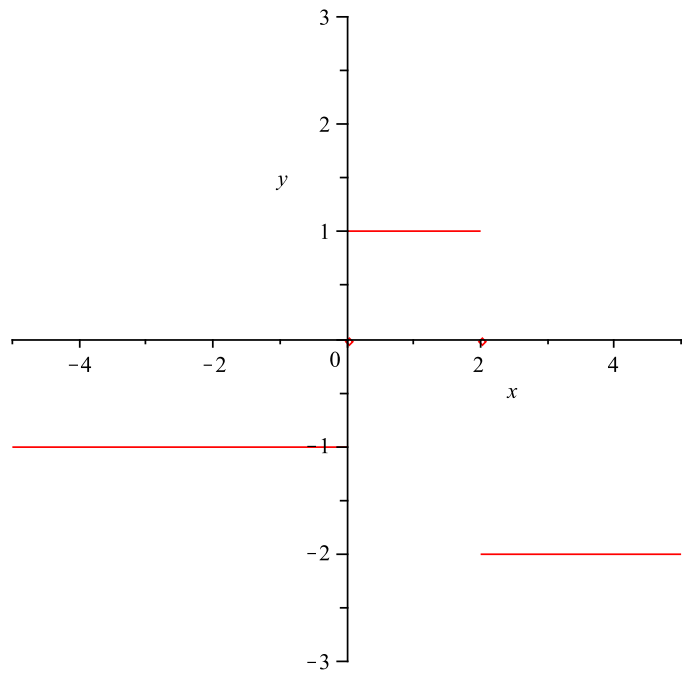
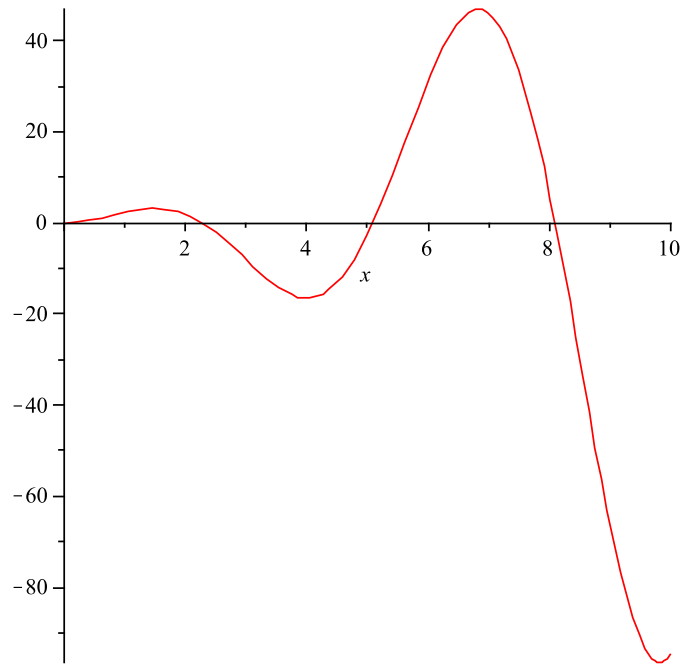


Math 251: Solutions to Review Problems for Exam 2

1. (a) $-\sin(3x^2)\sin(x) + 6x\cos(x)\cos(3x^2)$
- (b) $2^x \sec^2(x) + \ln(2)2^x \tan(x)$
- (c) $2xe^{x^2} - \frac{1}{x^{3/2}} - \frac{1}{x^2} = 2xe^{x^2} - \frac{1}{\sqrt{x^3}} - \frac{1}{x^2}$
- (d) $\frac{2xe^{2x} - 2(x^2 + 1)e^{2x}}{e^{4x}}$
- (e) $\frac{-3\sin(x) - 7x\sin(x) - 7\cos(x)}{(3 + 7x)^2}$
- (f) $20(3x^2 + 2x)^9(5x + 6)^3 + 9(3x^2 + 2x)^8(6x + 2)(5x + 6)^4 = (5x + 6)^3(3x^2 + 2x)^8(330x^2 + 454x + 108)$
- (g) $\frac{2x + 4}{3(x^2 + 4x)^{2/3}} = \frac{2x + 4}{3\sqrt[3]{(x^2 + 4x)^2}}$
- (h) $\frac{\cos(\sqrt{x})}{2\sqrt{x}}$
- (i) $\frac{-30(3x^2 + 4x)}{(x^3 + 2x^2 + 1)^{11}}$
- (j) $-\csc(x)\cot(x)$
- (k) $-x^2e^x \sin(x) + x^2e^x \cos(x) + 2xe^x \cos(x)$
- (l) $\frac{4y - 2xy}{x^2 + 6y - 4x}$
- (m) $\frac{-2x}{2y - 1}$
2. $y = -3x + 3$
3. $y = \frac{8}{5}x + \frac{2}{5}$. (Note: $\frac{dy}{dx} = \frac{12x - y^2}{1 + 2xy}$)
4. (a) $h'(1) = 12$
- (b) $h'(2) = \frac{9}{8}$
- (c) $h'(1) = 6$
- (d) $h'(1) = 12$
- (e) $h'(2) = 8$

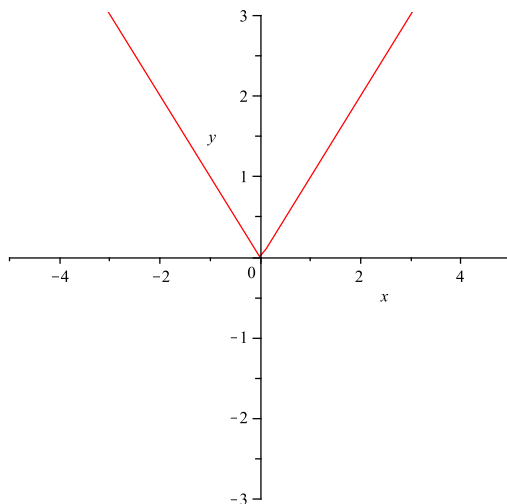
5.



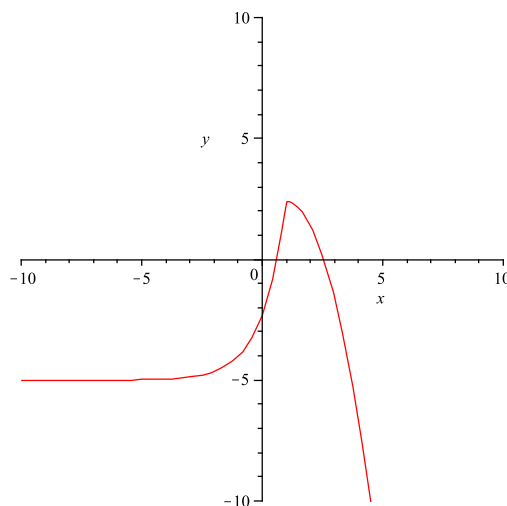
6. Problem 6 is an example from your book on page 201. See the book for the solution.

7. (a) The population is increasing when $t < 6$. This corresponds to when the derivative is positive.
(b) $P'(1) = 10$ thousand mice/year which means the mice population is growing at a rate of 10,000 mice/year and $P'(7) = -2$ thousand mice/year which means the population is decreasing at the rate of 2,000 mice/year.
(c) The population will eventually die out. I leave the explanation to you.

8. Possible graph (there is more than one possibility, but it should have this general shape):



9. Possible graph (there is more than one possibility, but it should have this general shape):



- 10.(a) The particle is speeding up on the interval $(0, 1)$. I leave the explanation to you.
(b) B has gone further after 4 seconds. I leave the explanation to you.