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# MATH 11009: Exam #4 (Spring 2009)

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1. Given  $f(x) = \frac{5x^2 + 6x + 1}{6x^2 - 13x + 6}$ , find the following:

(a) Horizontal asymptote, if it exists.

(b) Vertical asymptote(s).

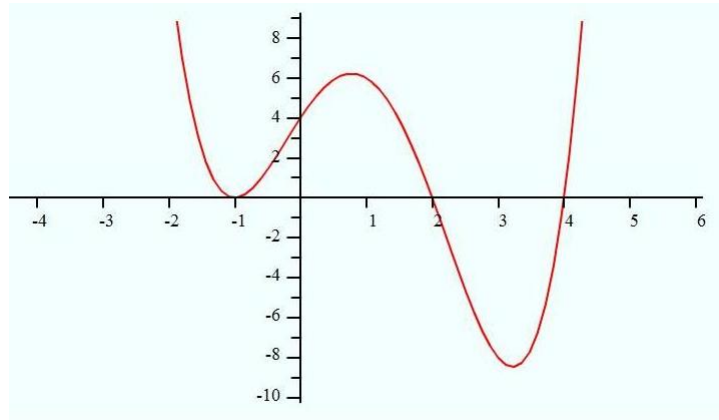
2. Find the following if  $f(x) = \begin{cases} 5 - 2x - 3x^2 & \text{if } x \leq -3 \\ 6x + 3 & \text{if } -3 < x < 2 \\ x^2 - 7x & \text{if } x \geq 2 \end{cases}$

(a)  $f(-3) =$

(b)  $f(2) =$

(c)  $f(-1) =$

3. Given the graph of  $f$  below, answer the following questions.



(a) The local maximum(s) occurs at what point? (If you can not tell exactly, give approximately).

(b) The local minimum(s) occurs at what point? (If you can not tell exactly, give approximately).

(c) The  $x$ -intercepts occur at what values of  $x$ ?

(d) Is the leading coefficient of  $f$  positive or negative? **Explain how you know.**

4. Use synthetic division to find the quotient and the remainder.

$$\frac{4x^4 - 2x^3 + 6x - 2}{x + 2}$$

5. The revenue for the sale of a product is given by the function  $R(x) = 187,500 - 3x^2$ . Determine the number of units that must be sold to give zero revenue.

6. Solve for  $x$ :

$$8x^3 + 20x^2 - 18x - 45 = 0$$

7. Solve for  $x$ :

$$5(7x + 4)^4 - 80 = 0$$

8. Solve for  $x$ :

$$\frac{x + 2}{x - 2} = \frac{5}{x + 5} + \frac{28}{x^2 + 3x - 10}$$

9. Use a sign chart to solve for  $x$ :

$$2x^3 - 2x^2 - 12x \geq 0$$

10. Find the horizontal asymptote of each function, if it exists.

(a)  $f(x) = \frac{9x^2}{x - 5}$

(b)  $g(x) = \frac{x}{x^2 - 25}$

11. The revenue from the sale of a product is given by the function

$$R(x) = -x^3 + 92x^2 - 145x.$$

If the sale of 7 units gives a total revenue of \$3150, use synthetic division to find another number of units that will give \$3150 in revenue.

12. Let  $P(x) = 6x^4 + 11x^3 - 66x^2 - 59x - 12$ .

(a) Use synthetic division to show that  $x = -\frac{1}{2}$  is a zero.

(b) Find all other real zeros of  $P$ .

### ANSWERS

1. (a)  $y = \frac{5}{6}$                       (b)  $x = \frac{2}{3}, x = \frac{3}{2}$
2. (a)  $-16$                       (b)  $-10$                       (c)  $-3$
3. (a)  $(0.75, 6)$   
(b)  $(-1, 0)$  and  $(3.2, -8.5)$   
(c)  $x = -1, x = 2, x = 4$   
(d) positive, since both ends pointing up
4.  $Q(x) = 4x^3 - 10x^2 + 20x - 34, R(x) = 66$
5. 250 units
6.  $x = \frac{3}{2}, x = -\frac{5}{2}, x = -\frac{3}{2}$
7.  $x = -\frac{2}{7}, x = -\frac{6}{7}$
8.  $x = -4$  (NOTE:  $x = 2$  does not check)
9.  $[-2, 0] \cup [3, \infty)$
10. (a) none                      (b)  $y = 0$
11. 90 units
12. (a) Use synthetic division to show that the remainder is zero.  
(b)  $x = 3, x = -\frac{1}{3}, x = -4$