Fake Exam 4 Calc 1 11/16/2016

Each problem is worth 0 points. For full credit learn enough to do well on the real exam.

1. Evaluate $\lim_{x \to -5} \frac{x^2 - 25}{5 - 4x - x^2}$.

   It should work out to -5/3.

2. Evaluate $\lim_{x \to \infty} \frac{x^2 - 25}{5 - 4x - x^2}$.

   It should be -1.

3. Find all vertical asymptotes of $f(x)=\dfrac{x^2-25}{5-4x-x^2}$. Determine the one-sided limits at each.

The actual vertical asymptote is at x = 1. The limit approaching it from the left is - ∞ and the limit approaching it from the right is + ∞.

4. a) Find the intervals on which $f(x)=\dfrac{x^2-25}{5-4x-x^2}$ is increasing.

   b) Find the intervals on which $f(x)=\dfrac{x^2-25}{5-4x-x^2}$ is decreasing.

It works out to have a negative derivative for all x except 1, so it's decreasing on $(-\infty,1)$ and $(1,+\infty)$.

5. Find all critical points of $f(x) = 2x^3 - 5x^2 + 2x - 7$.

$\dfrac{5+\sqrt{13}}{6}$ and $\dfrac{5-\sqrt{13}}{6}$

6. Find the largest interval on which $f(x) = 2x^3 - 5x^2 + 2x - 7$ is decreasing.

$$\left(\frac{5-\sqrt{13}}{6}, \frac{5+\sqrt{13}}{6}\right)$$

7. Find the absolute maximum and minimum values of $f(x) = 2x^3 - 5x^2 + 2x - 7$ on [0,2].

For the question as it appears, the maximum is $f\left(\frac{5-\sqrt{13}}{6}\right)$ and the minimum is $f\left(\frac{5+\sqrt{13}}{6}\right)$. I wish I'd asked about [0,3], in which case the maximum instead is f(3) = 8.

8. Find the largest interval on which $f(x) = 2x^3 - 4x^2 + 2x - 7$ is concave down.

$(-\infty, 2/3)$

9. Find the x-intercept of $f(x) = 2x^3 - 5x^2 + 2x - 7$.

Newton's Method is one good tool. If you use $x_0 = 2$, you'll get $x_1 = 19/6$. The actual root is around 2.626598, but that takes a lot of iteration.

10. Jon plans to sell jet-propelled golf balls. In his trial program he sold 200 golf balls each week at a price of \$100 apiece. His market research firm tells him that for each \$1 he drops his price, he can sell 5 additional golf balls. The golf balls cost \$60 each to produce. What price should he charge to bring in the largest possible revenue?

As it's printed, to maximize the revenue, he should raise the price by \$30, so the price should be \$130.

If on the other hand he's smart enough to maximize profit (revenue minus cost), then he should raise the price by \$24, so the price should be \$124 to maximize profit.