Math 34A - Practice Test 2

1. Instructions

1.1. Problem 1. Assume x satisfies:

$$e^{2x-1} + \frac{1}{e} = 2e^{x-1}$$

What is x?

Scratch Work

Answer:

1.2. Problem 2. Let $f(x) = 2x^5 + 5x^2 + 10$. Compute the derivative $f'(x)$.

Scratch Work

Answer:

1.3. Problem 3. Let $g(x) = x^3 - 3x + 4$.

Find the equation of the tangent line at the point 1. (In $y = mx + b$ form).

Scratch Work

Answer:

2. Multi-part problems

2.1. Problem 4 - Top Chef.

2.1.1. *Set-up.* This week, we will be reverse-searing a steak.[1] This is easier than some of the other recipes - we only have one ingredient to worry about.

To cook our steak perfectly, we will put it in an oven until the internal temperature is exactly 118 degrees Fahrenheit.

- The starting temperature of the steak is 80 degrees Fahrenheit.
- 7 minutes after we put the steak in the oven, the temperature is 86 degrees.
- 14 minutes after we put the steak in the oven, the temperature is 92 degrees.
- 21 minutes after we put the steak in the oven, the temperature is 98 degrees.

2.1.2. *Questions.*

(1) What is the internal temperature, in degrees Fahrenheit, t minutes after putting the steak in the oven?

(2) How many minutes should the steak remain in the oven to achieve the desired internal temperature?

[1] If you're vegetarian or don't want to think about eating meat, feel free to replace steak with whatever you want.

2.1.3. *Scratch Work.*

2.1.4. *Answers.*

(1) Temperature after t minutes:

(2) Cooking time: (in minutes)

2.2. Problem 5 - Cartesian Geometry.

2.2.1. *Set-up.* I'm thinking of a function $f(x)$, which has the form $f(x) = 2x^3 + bx^2 + d$. I won't tell you what the function is, but I'll tell you this:

$$f\left(-\frac{1}{2}\right) = 0$$

and:

$$f(1) = 0$$

(*See Figure 1.*)

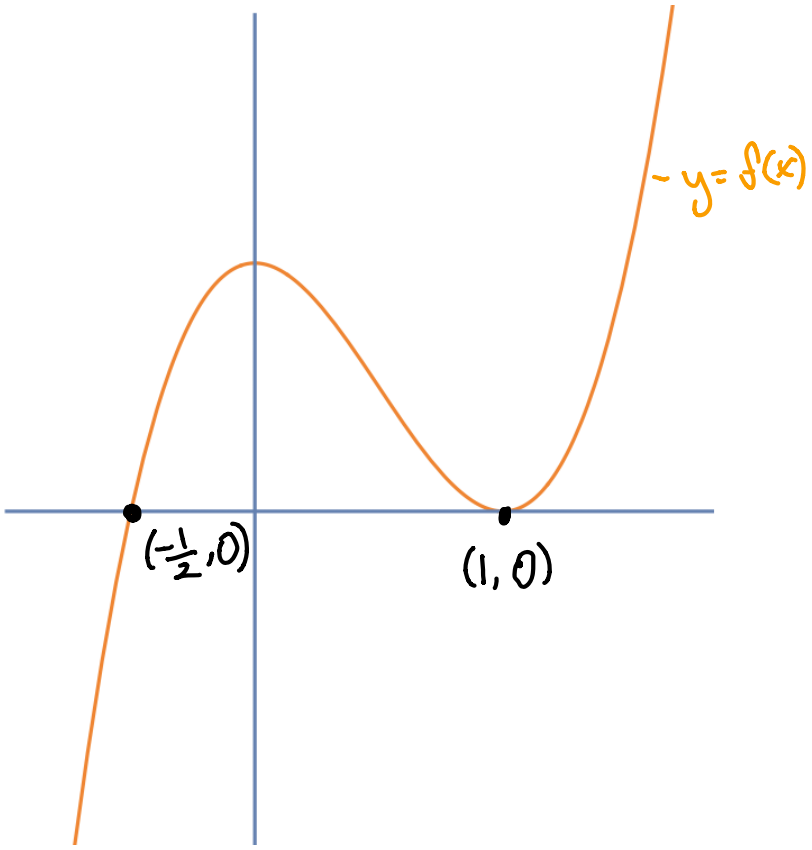

FIGURE 1. Graph of $f(x)$

2.2.2. *Questions.*

(1) Solve for b, d.
(2) What is $f(2)$?

2.2.3. *Scratch work.*

2.2.4. *Answers.*

(1) Equation of f $(x) =$

(2) $f(2) =$

2.3. Problem 6: Paddy's Pub.

2.3.1. *Set-up.* The basement of Paddy's pub has a pest problem. At first, it was just rats, but today, there were 200 rats and also 3 cockroaches! The rat population doubles every 6 days, but the roach population doubles every 2 days.

So in 6 days, the rat population is 400 and the roach population is 24.

2.3.2. *Questions.*

(1) How many rats are there after d days?
(2) How many cockroaches are there after d days?
(3) In how many days will there be more cockroaches than rats?

2.3.3. *Scratch work.*

2.3.4. *Answers.*

(1) Rat population (as a function in d):

(2) Cockroach population (as a function in d):

(3) Number of days: