Question 1

Which sample exam question from the oral exam study guide would you like to answer? Please give the question's number and letter, and then describe your solution.

Question 2

Find an equation of a line tangent to the graph of $f(x) = \ln(2x + 1) + 3$ at $(0, 3)$.

Question 2

If $f(x) = (e^{2x} + 1)^4$, then what is $f'(0)$?

Question 3

Determine the following limit (if it exists):

$$\lim_{x \to 2} \frac{x^2 - 4}{|x - 2|}$$

Question 3

Determine the following limit (if it exists):

$$\lim_{x \to 2} \frac{x-2}{\sqrt{x-2}}$$

Alternative to Questions 2 and 3

On what interval(s) is the function $f(x) = 1 - (x-2)^2$ increasing? decreasing?

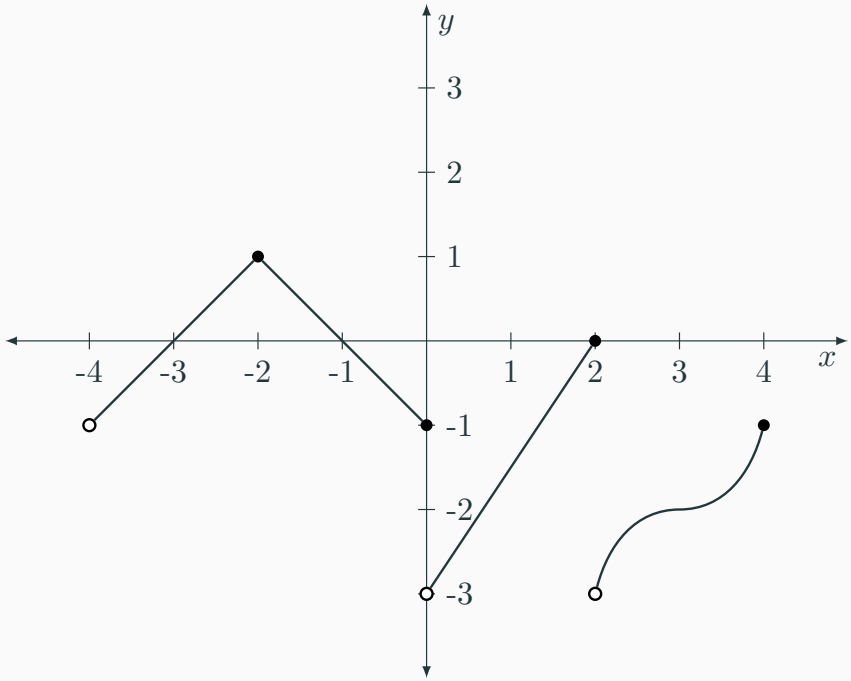
Question 4

a) What is $\lim_{x \to 2^+} f(x)$?

b) What is $f'(1)$?

c) What $\int_{-3}^{0} f(x)\,dx$?

d) What is a point of inflection on the graph of f?



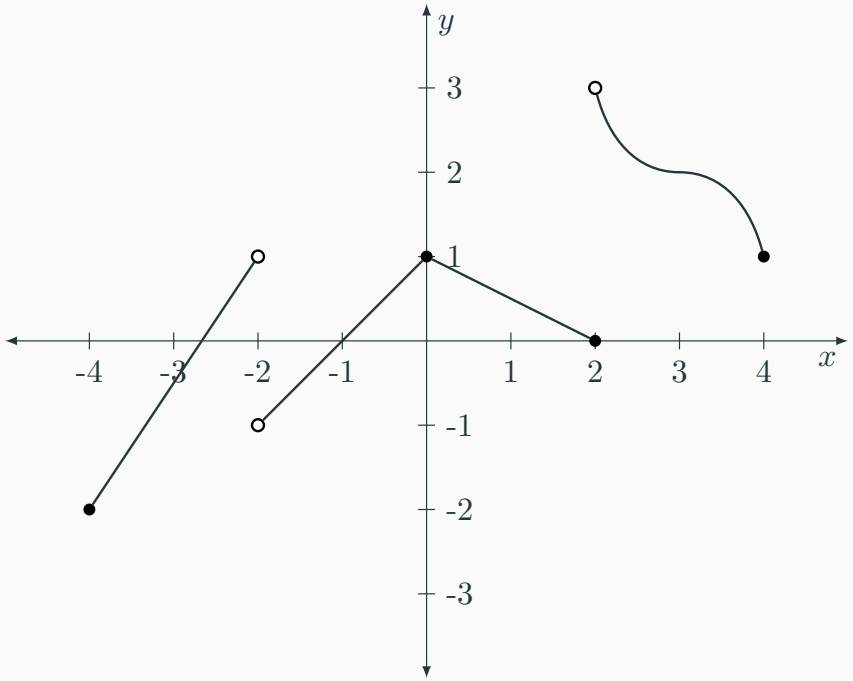
Question 4

a) What is $\lim_{x \to 2^+} f(x)$?

b) What is $f'(-3)$?

c) What $\int_{-2}^{2} f(x)\,dx$?

d) What is a point of inflection on the graph of f?



Question 5

What steps would you take the find the relative maximums and relative minimums of a function $f(x)$?

Question 5

Suppose that $f(x)$ is a continuous function on a closed interval $[a, b]$. What steps would you take the find the absolute maximum of $f(x)$?

Question 6

Describe the concavity of $\ln(5x)$. Explain your answer.

Question 6

Describe the concavity of e^{-5x}. Explain your answer.

Question 7

The population of a bacteria in a culture at time t is modeled by the function $p(t)$, where t is measured in hours. Suppose that the rate of change of p with respect to time is modeled by

$$p'(t) = 300\sqrt{t} + 50$$

and the initial population is given by $p(0) = 10$. Find a formula for $p(t)$.

Question 7

The population of a species of tiger at time t is modeled by the function $p(t)$, where t is measured in years. Suppose that the rate of change of p with respect to time is modeled by

$$p'(t) = 30\sqrt{t} + 5$$

and the initial population is given by $p(0) = 100$. Find a formula for $p(t)$.

Bonus Round!

Question 8

a) What is $4^{-\frac{3}{2}}$?

b) What is $\ln(\sqrt[3]{e})$?

Question 8

a) What is $27^{-\frac{2}{3}}$?

b) What is $e^{2\ln(3)}$?

Question 9

True/False: If $f(t)$ and $g(t)$ are both decreasing functions, then $f(t) - g(t)$ must also be a decreasing function.

Why or why not?

Question 9

True/False: If $f''(a) = 0$, then $(a, f(a))$ is an inflection point on the graph of f?

Why or why not?