_____ / 53 total points

Test #1

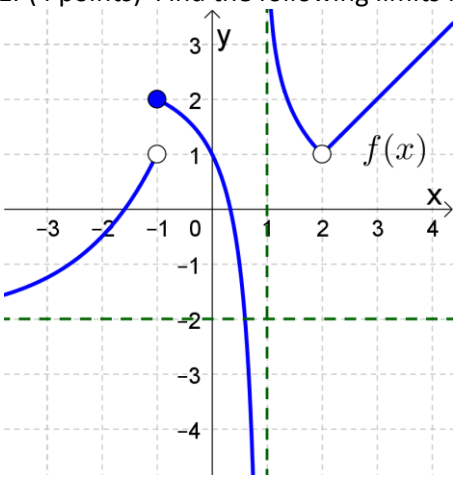
Name: _____

Math 180, Prof. Beydler

Wednesday, April 8, 2020

Directions: We're working on the honor system here: no notes, books, phones, or computers during the test (except for using a computer to write your answers). Also, no getting help from other people. You may e-mail me to ask for clarification about any problem. **Show all work**. A **scientific calculator** is allowed. Write your answers in the indicated places, or box your answers. Good luck!

1. (4 points) Find the following limits for the below graph of $f(x)$.



$\lim_{x\to -1^-} f(x)$ $\lim_{x\to -1^+} f(x)$ $\lim_{x\to -1} f(x)$

$\lim_{x\to 2^-} f(x)$ $\lim_{x\to 0} f(x)$ $\lim_{x\to 1} f(x)$

$\lim_{x\to -\infty} f(x)$ $\lim_{x\to \infty} f(x)$

2. (3 points) Using the graph of $f(x)$ from the previous question, answer the following. No need to give reasons here.

a) Is f continuous or discontinuous at $x = -1$? continuous discontinuous (circle one)

b) Is f continuous from the left at $x = 1$? yes no (circle one)

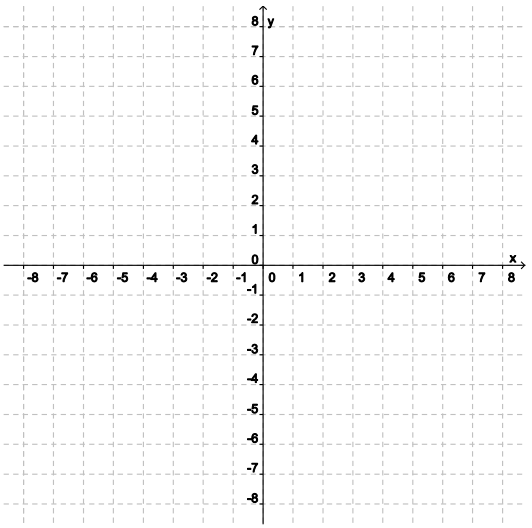
c) Is f continuous from the right at $x = 0$? yes no (circle one)

d) Is f differentiable at $x = -3$? yes no (circle one)

e) Find $f'(3)$. Answer: _____

f) Find $f'(2)$. Answer: _____

3. (2 points) Sketch the graph of an example of a function f that satisfies $\lim_{x\to -\infty} f(x) = -1$, $\lim_{x\to 2} f(x) = \infty$, discontinuous from the right at $x = 0$, and $f(-2) = 3$. Be sure to draw any asymptotes of f.



4. Find the following limits.

a) (2 points) $\lim_{x\to -1^-} \frac{x^2+x-1}{x+1}$

Answer: _____

b) (2 points) $\lim_{x\to 2} \frac{x^2+7x-18}{3x^2-5x-2}$

Answer: _____

c) (2 points) $\lim_{x\to -\infty} \frac{\sqrt{3x^2+5}}{x+2}$

Answer: _____

d) (2 points) $\lim_{x\to 0^+} 3^{\ln\sqrt{x}}$

Answer: _____

e) (2 points) $\lim_{x\to 0^+}\left(-\csc x - e^{1/x}\right)$

Answer: _____

5. (3 points) Use the Squeeze Theorem to prove that $\lim_{x\to 0} x^2 \sin\left(\frac{1}{x}\right) = 0$.

6. (2 points) Find all values of c such that $f(x) = \begin{cases} x^2 - c & \text{if } x \le 2 \\ \sin\frac{\pi}{4}x & \text{if } x > 2 \end{cases}$ is continuous on $(-\infty, \infty)$.

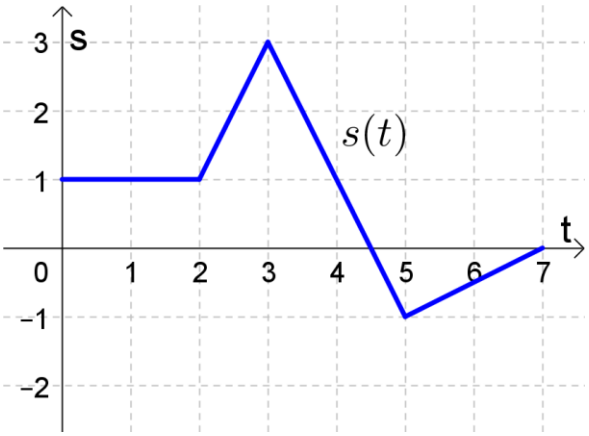
$c =$ _____

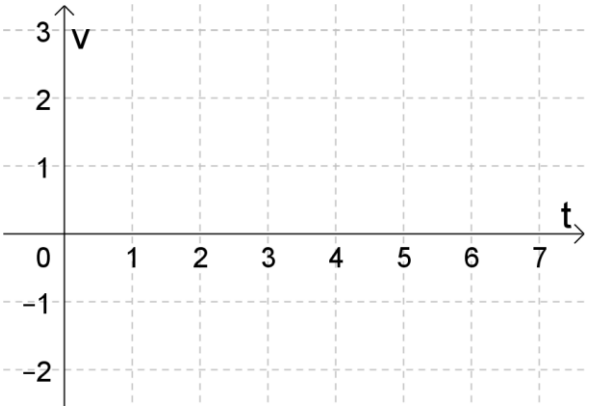
7. (3 points) Use the Intermediate Value Theorem to show that there is a root of $x - 3 = \sin 2x$ in the interval $\left(\frac{\pi}{2}, \pi\right)$.

8. (4 points) Find the derivative of $f(x) = \sqrt{x+2}$ using the limit definition.

Answer: _____

9. (2 points) Suppose you move back and forth along a line, and that your position over time is given by the function $s(t)$ below. Graph the velocity function $v(t)$.





10. Differentiate the following functions.

a) (3 points) $f(x) = 3^x - \frac{2}{\sqrt[3]{x}} + 4\ln x + \tan x + 2^\pi + 2\sin^{-1} x$

Answer: _____

b) (3 points) $f(x) = \frac{\sinh x}{x^2 e^x}$ (for this one, don't worry about simplifying your answer)

Answer: _____

c) (3 points) $f(x) = \frac{\cos x}{2x^2 - \sec x}$ (for this one, don't worry about simplifying your answer)

Answer: _____

d) (3 points) $f(x) = \sin^2(3^x)$ (for this one, don't worry about simplifying your answer)

Answer: _____

e) (3 points) $f(x) = \ln\left(\csc\sqrt{x}\right)$ (for this one, don't worry about simplifying your answer)

Answer: _____

11. (3 points) Find an equation for the tangent line to $y = x^2 \ln x$ at the point $(1, 0)$.

Answer: _____

12. (2 points) Find the second derivative of $y = \tan 4x$.

Answer: _____

Note: Be sure to double check your work. And remember to submit your homework and review exercises! ☺