# Exam #1, ver B

February 1, 2018

Name _____

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.

- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.

- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who opens a cell phone during the examination or if one is found on their seat or hand.

No calculators are allowed!

Honor Code: On my honor, I have neither received nor given any aid during this examination.

Signature: _____

1. (5 points) For the function $f(x)$ graphed below, find the following (justify your answer if the limit does not exist)

(a) $f(-2)$
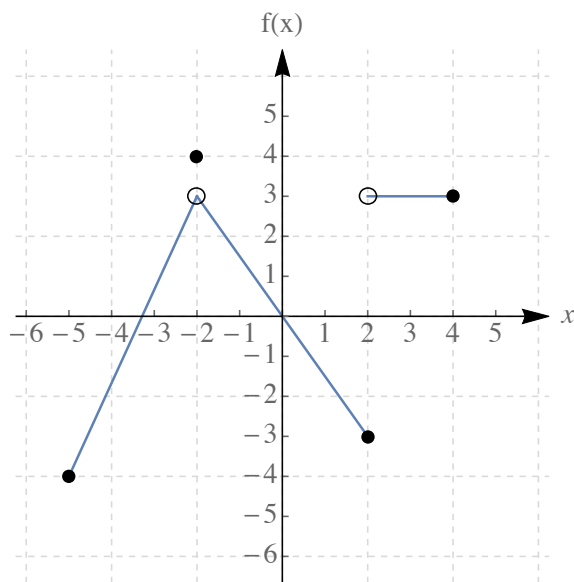
(b) $\lim\limits_{x \to -2} f(x)$

(c) $\lim\limits_{x \to 2^+} f(x)$

(d) $\lim\limits_{x \to 2^-} f(x)$

(e) $\lim\limits_{x \to 2} f(x)$

2. (5 points each) Evaluate the following limits algebraically, if they exist:

a) $\lim\limits_{x \to 1} \dfrac{x - 1}{\sqrt{x} - 1}$

b) $\displaystyle\lim_{x \to -5} \frac{x^2 + 4x - 5}{x^2 - 25}$

c) $\displaystyle\lim_{x \to \infty} \frac{2x^2 + 1}{x + 1}$

d) $\displaystyle\lim_{x \to 5^+} \frac{\sqrt{2x - 1} - 3}{x - 5}$

3. (5 points each) Differentiate the following function and simplify the derivative

   (a) $f(x) = \frac{3}{x} + \frac{8}{3}\sqrt{x} - \frac{4}{\sqrt{x}}$

   (b) $f(t) = \frac{t^2 - 4}{t^2 - 1}$

   (c) $y = (x^2 + 6)(3 + 4x^2)$

   (d) $f(x) = \frac{1 - x}{x}$

4. (10 points each) Find the first and second derivative of the function and simplify your answer

   (a) $f(x) = x^4 - 2x^2 + 12x - 40$

(b) $g(x) = (1 - 2x)(1 + \frac{2}{x})$

(c) $h(x) = \sqrt{x} + \frac{4}{x} + x^2 - 3$

5. (5 points) State the definition of a continuous function at a point.

6. (5 points) Find the derivative of the function using the **definition of derivative**. [You will get no credit for using the power rule for differentiation.]

$$f(x) = x^2 - 4x$$

7. (5 points) Find the equation of the tangent line in the form $y = mx + b$, at the point $(-1, 3)$ for the function $f(x) = (x - 2)x$

8. (5 points) A bacterial colony is estimated to have a population of

$$P(t) = \frac{24}{t+2}$$

million t hours after the introduction of a toxin. At what rate is the population changing three hours after the toxin is introduced (t=0)?

9. (5 points) Find the rate of change $\frac{dy}{dx}$ for x=2,

$$y = \frac{x}{x-1}$$

10. (3 extra credit points) If $\lim_{x \to \infty} f(x) = 2$, then the horizontal asymptote of f is the line $y = 2$. (true/false)

11. (3 extra credit points) If $f'(1) = 5$, then the slope of the tangent line to f at $x = 5$ is 1. (true/false)

Use this page if you need more space for a problem.