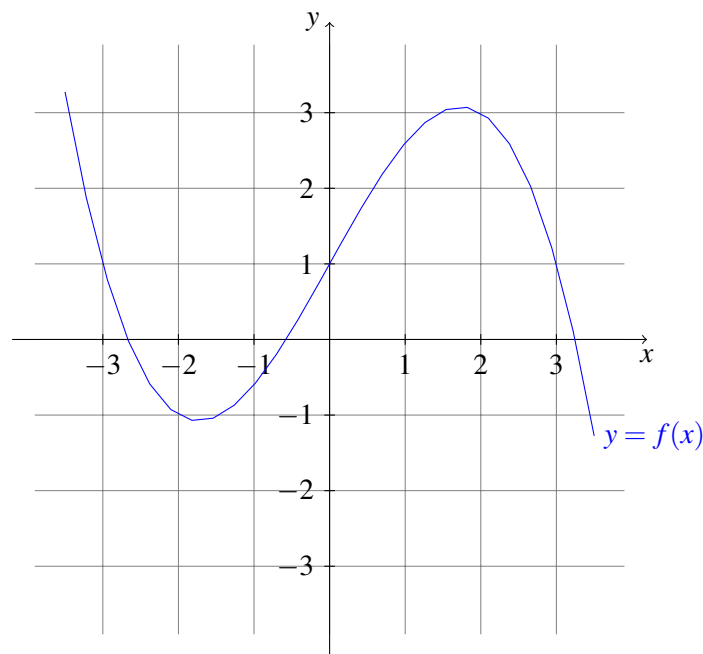


Math 113 Test 1 Practice

- You may use one 3x5 card with notes (both sides, if you wish). Calculators or computers are not allowed.
- The actual test will not be this long.

- (1) Write a function that expresses the surface area of a cube as a function of its volume.
- (2) Suppose the graph of $y = f(x)$ is below. On the same set of axes, sketch the graphs of
- $y = f(-x)$,
 - $y = f(x/2)$,
 - $y = f(x)/2$,
 - $y = f(x) + 2$,
 - $y = f(x + 2)$.

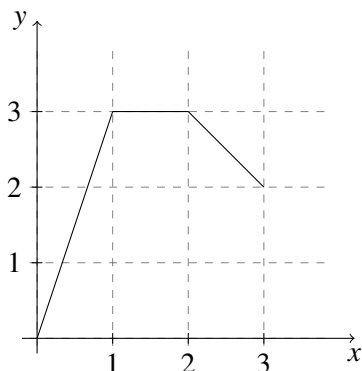
(Be sure to label your graphs.)



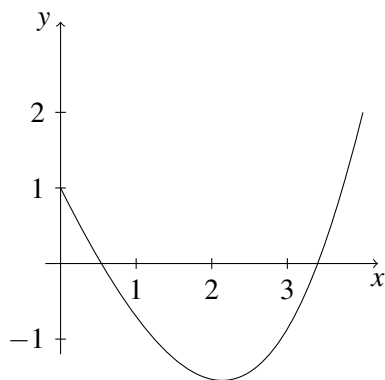
- (3) Simplify the following expressions.
- $e^{\ln 5 + \ln x}$
 - $\ln(15x) - \ln(15/x)$
 - $e^{2 \ln x - 3 \ln y}$
 - $\ln(e^x e^y)$
- (4) After taking a 40mg oral dose of fluoxetine (commonly known as Prozac), it is rapidly taken into the blood to a concentration of 21 ng/ml. The concentration decays exponentially, with a half-life of 1.5 days (meaning that, if the concentration today is c , the concentration in 1.5 days will be $c/2$). Give a formula for the concentration $F(t)$ at time t , t in days after dosage. (Expressions like $27 \ln 2$ can be left in that form.)
- (5) State the limit definition of the derivative and use it to calculate the derivative of $f(x) = 2/x$.
- (6) Evaluate the following limits or show that they do not exist. If the limit diverges to ∞ or $-\infty$, indicate this.
- $\lim_{x \rightarrow -\infty} \frac{3x^3 - 4x + 1}{5x^2 - 8x + 2}$
 - $\lim_{x \rightarrow 3^+} \frac{x^2 - 9}{x^2 - x - 6}$

(c) $\lim_{x \rightarrow 4^-} \frac{x^2 - 9}{x^2 - 7x + 12}$

- (7) Suppose the following graph gives the height $h(t)$ of a balloon, in km, as a function of time (t is measured in hours past noon). Assume the balloon only moves up and down.



- (a) Sketch the graph of the balloon's velocity. What are the units?
 (b) What is the balloon's average velocity between noon and 3pm?
- (8) Suppose the following is the graph of $y = f'(x)$. Sketch two possibilities for what $y = f(x)$ might look like.



- (9) Calculate the derivatives of the following functions. (Remember that simplifying or rewriting the function another way can make this easier sometimes.)
 (a) $T(x) = 8x^4 - 8x^2 + 1$
 (b) $v(t) = e^t(\sqrt{t} + \cos t)$
- (10) Find the line tangent to $y = \cos x$ at $x = \pi/6$.
- (11) Find the inverse of the function $f(x) = \ln(x + 1)$.
- (12) Sketch the graph of a function that is differentiable at $x = 0$, continuous but not differentiable at $x = 1$, and discontinuous at $x = 2$.