Math 1131 Week 1 Worksheet

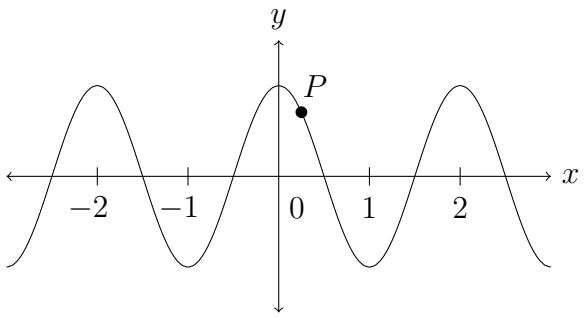
Name: _____

Discussion Section:_____

Solutions should show all of your work, not just a single final answer.

2.1: The Tangent and Velocity Problems

1. The point $P = (1/4, 1/\sqrt{2})$ lies on the curve $y = \cos(\pi x)$ where x is in **radians**, as shown below.



(a) If $Q = (x, \cos(\pi x))$ then use your calculator to find the slope of the secant line PQ, *rounded to four digits after the decimal point*, for the following values of x:

(i) 0.24,

(ii) 0.249,

(iii) 0.2499,

(iv) 0.26,

(v) 0.251,

(vi) 0.2501.

(b) Using the results of part(a), estimate the value of the slope of the tangent line to the curve at $(1/4, 1/\sqrt{2})$ to three digits after the decimal point.

(c) Using the estimated slope from part(b), what is an estimate for the equation of the tangent line to the graph of $y = \cos(\pi x)$ at $(1/4, 1/\sqrt{2})$? Write the final answer in the form $y = mx + b$ where m and b are each rounded to three digits after the decimal point.

2. The displacement of an object on a line, in meters, is $s = 1 + 2t + \frac{1}{4}t^2$, where t is in seconds.

(a) Find the average velocity in m/sec over each of the following time periods. For parts (i) through (v), *round your answer to three digits after the decimal point.* In part (vi) , h is a nonzero variable and the final answer is in terms of h.

(i) $[1, 1.5]$

(ii) $[1, 1.1]$

(iii) $[1, 1.01]$

(iv) $[.9, 1]$

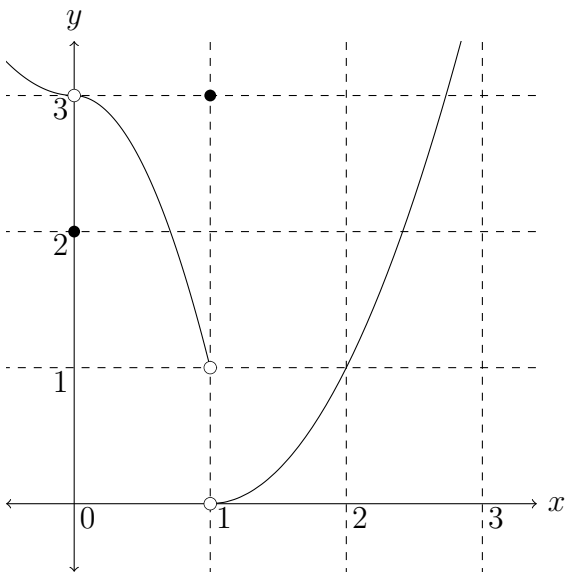
(v) $[.99, 1]$

(vi) $[1, 1 + h]$ (for $h > 0$) or $[1 + h, 1]$ (for $h < 0$)

(b) Use the work in part a to estimate the instantaneous velocity of the object at time $t = 1$, in m/sec.

2.2: The Limit of a Function

3. The graph of $y = f(x)$ is below. Use it to compute each limit or explain why it doesn't exist.



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

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

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

(d) $\lim_{x \to 0^+} f(x)$

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

(f) $\lim_{x \to 2+} f(x)$

(g) $\lim_{x \to 0} f(x)$

(h) $\lim_{x \to 1} f(x)$

(i) $\lim_{x \to 2} f(x)$

(j) $f(0)$

(k) $f(1)$

(l) $f(2)$

4. Determine whether the following limits are finite, ∞, or $-\infty$. If the limit does not exist for any other reason, write DNE with a justification.

   (a) $\lim_{x\to 1} \dfrac{\sqrt{x}}{2(x-1)^2}$

   (b) $\lim_{x\to 1+} \dfrac{x-2}{x-1}$

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

5. T/F (with justification) The line $x = 1$ is a vertical asymptote of the graph of $y = \dfrac{x^2-1}{x^2-2x+1}$.

6. T/F (with justification) The line $x = 1$ is a vertical asymptote of the graph of $y = \dfrac{x^2-2x+1}{x^2-1}$.