AP Calculus
3.5 Worksheet

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

1. A spring is bobbing up and down so that its position at any time $t \geq 0$ is given by $s(t) = -4\sin t$.

   a) What is the initial position of the spring?

   b) Which way is the particle moving to start? Justify your response.

   c) At $t = \frac{5\pi}{4}$, is the spring moving up or down? Justify your response.

   d) Is the spring speeding up or slowing down at $t = \frac{5\pi}{4}$? Justify your response.

2. If $y = \sec x$, find $\frac{d^2y}{dx^2}$.

3. If $f(x) = \sin x$, find $f'(x)$, $f''(x)$, $f'''(x)$, and $f^{(4)}(x)$. What do you think the function $f^{(100)}(x)$ is?

4. $\lim_{h \to 0} \frac{\sin(x+h) - \sin x}{h} =$

A) 0 B) 1 C) sin x D) cos x E) nonexistent

5. An equation of the line tangent to the graph of $y = x + \cos x$ at the point (0, 1) is

A) $y = 2x + 1$ B) $y = x + 1$ C) $y = x$ D) $y = x - 1$ E) $y = 0$

6. If $y = \tan x - \cot x$, then $\frac{dy}{dx} =$

A) sec x csc x B) sec x – csc x C) sec x + csc x D) $\sec^2 x - \csc^2 x$ E) $\sec^2 x - \csc^2 x$

7. If $f(x)=\dfrac{x}{\tan x}$, then $f'\left(\frac{\pi}{4}\right)=$

A) 2 B) $\frac{1}{2}$ C) $1+\frac{\pi}{2}$ D) $\frac{\pi}{2}-1$ E) $1-\frac{\pi}{2}$

8. [Calculator] A particle moves along a line so that at time t, $0 \le t \le \pi$, its position is given by $s(t)=-4\cos t-\dfrac{t^2}{2}+10$. What is the velocity of the particle when its acceleration is zero?

A) –5.19 B) 0.74 C) 1.32 D) 2.55 E) 8.13

9. If $f(x)=\sin x$, then $f'\left(\frac{\pi}{3}\right)=$

A) $-\frac{1}{2}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{2}$ E) $\sqrt{3}$

10. [Calculator] A body is moving in simple harmonic motion (up/down) with position $s(t)=3+\cos t$, where $0 \le t < 2\pi$.

a) Find the velocity, $v(t)$, of the object at any time t.

b) Find the zeros of $v(t)$.

c) Find the acceleration, $a(t)$, of the object at any time t.

d) Find the zeros of $a(t)$.

e) When is the object stopped? Justify your response.

f) When does the object change direction? Justify your response.

g) When does the object speed up? Justify your response.

11. Complete the following questions from the textbook: pages 146 – 147 #1, 4, 5, 9, 16, 22, 23, 27, 30, 32, 36, 37, 40, 41

… you should also begin reviewing for your chapter test 3.1 – 3.5: Review: #1 – 4, 43, 53, 57, 59 – 63, 71, 73
This isn't due until the day of your exam.