Derivatives of Trigonometric Functions

1. 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) $\frac{\sqrt{3}}{2}$

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2. The $\lim\limits_{h \to 0} \frac{\tan(\pi+h)-\tan(\pi)}{h}$ is:

(A) -1

(B) 0

(C) 1

(D) does not exist

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

(A) $\sec x \tan x$

(B) $\sec^3 x \tan x$

(C) $\sec x \tan x + \sec^2 x$

(D) $\sec x \tan^2 x + \sec^3 x$

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4. Given $f(x) = \cos x$ and $g(x) = x^2 + 3x$, if $h(x) = f(x)g(x)$, find $h'(x)$.

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5. Given the velocity of a particle is $v(t) = \cos t$ on the interval $[0, 2\pi)$, when is the particle speeding up?