4.6 Continued

Trigonometric Antiderivatives

$$\int \sin x \, dx =$$

$$\int \cos x \, dx =$$

$$\int \tan x \, dx =$$

$$\int \csc x \, dx =$$

$$\int \sec x \, dx =$$

$$\int \cot x \, dx =$$

ex: Integrate.

a) $\int \tan 5x \, dx$

ex: Integrate.

b) $\int_{\pi/4}^{\pi/2} \sqrt{\csc^2 x - 1}\, dx$

ex:

Evaluate $\int_0^{\frac{\pi}{4}} \frac{2e^{\tan x}+5}{\cos^2 x}\,dx$

(A) $2e+3$ (B) $2e$ (C) $2e-3$ (D) e (E) $e+5$

ex:

Evaluate $\int_{e}^{e^4} \frac{5}{x\sqrt{\ln x}}\,dx$

(A) 6 (B) 7 (C) 8 (D) 9 (E) 10

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A particle starts at the point $(5,0)$ at $t=0$ and moves along the x-axis in such a way that at time $t>0$ its velocity $v(t)$ is given by $v(t)=\dfrac{t}{1+t^2}$.

(a) Determine the maximum velocity attained by the particle. Justify your answer.

(b) Determine the position of the particle at $t=6$.

(c) Find the limiting value of the velocity as t increases without bound.

4.7 Inverse Trigonometry: Integration

Review:

$$\frac{d}{dx}\left[\sin^{-1} x\right] = \qquad \frac{d}{dx}\left[\csc^{-1} x\right] =$$

$$\frac{d}{dx}\left[\cos^{-1} x\right] = \qquad \frac{d}{dx}\left[\sec^{-1} x\right] =$$

$$\frac{d}{dx}\left[\tan^{-1} x\right] = \qquad \frac{d}{dx}\left[\cot^{-1} x\right] =$$

THEOREM 4.20 Integrals Involving Inverse Trigonometric Functions

Let u be a differentiable function of x, and let $a > 0$.

1. $\displaystyle\int \frac{du}{\sqrt{a^2 - u^2}} =$

2. $\displaystyle\int \frac{du}{a^2 + u^2} =$

3. $\displaystyle\int \frac{du}{u\sqrt{u^2 - a^2}} =$

ex: Integrate.

a) $\int \frac{dx}{1+9x^2}$

ex: Integrate.

b) $\int \frac{dx}{x\sqrt{4x^2-9}}$

ex: Integrate.

c) $\int \frac{\sin x dx}{\sqrt{25-\cos^2 x}}$

ex: Integrate.

d) $\int \frac{7dx}{16+x^2}$

ex: Integrate.

e) $\int \frac{xdx}{\sqrt{25-x^2}}$

ex: Integrate.

g) $\int \frac{e^{2x}dx}{1+e^{2x}}$

ex: Integrate.

h) $\int \frac{\sin x dx}{1+\cos^2 x}$

ex: Integrate.

k) $\int \frac{\arccos x dx}{\sqrt{1-x^2}}$

ex: Integrate.

1) $\int \frac{dx}{x^2 - 2x + 2}$

ex: Integrate.

n) $\int \frac{dx}{\sqrt{-x^2-4x}}$

ex: Integrate.

o) $\int \frac{dx}{x^2+4x+13}$

ex: Integrate.

 p) $\int \frac{x+5}{\sqrt{9-x^2}}dx$

ex: Integrate.

 q) $\int \frac{x+1}{x^2+9} dx$

ex: Integrate.

s) $\int \frac{2x-3}{\sqrt{4x-x^2}}dx$

ex: Integrate.

 t) $\int \frac{x^3}{1+x^2} dx$