Math 1540 Calculus I Practice Final Exam Fall 2007

Name: Last _____, First _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use a Graphing Calculator to plot the function near the point x_0 being approached. From your plot guess the value of the limit.

1) $\lim_{x \to 3} \frac{x^2 - 9}{\sqrt{x^2 + 7} - 4}$ 1) _____

A) 3 B) $\frac{1}{4}$ C) 4 D) 8

Find the equation for the tangent to the curve at the given point.

2) $f(x) = x - \sqrt{x}$; (1, 0) 2) _____

A) $y = -7x + 28$ B) $y = \frac{1}{2}x - \frac{1}{2}$ C) $y = -7x - 9$ D) $y = \frac{1}{4}x + 1$

Find the second derivative of the function.

3) $y = \frac{(x - 10)(x^2 + 2x)}{x^3}$ 3) _____

A) $\frac{d^2y}{dx^2} = \frac{16}{x^3} + \frac{120}{x^4}$ B) $\frac{d^2y}{dx^2} = -\frac{16}{x^3} - \frac{120}{x^4}$

C) $\frac{d^2y}{dx^2} = -\frac{16}{x} - \frac{120}{x^2}$ D) $\frac{d^2y}{dx^2} = \frac{8}{x^2} + \frac{40}{x^3}$

Find the derivative.

4) $y = \frac{\sin x}{7x} + \frac{7x}{\sin x}$ 4) _____

A) $\frac{dy}{dx} = \frac{\sin x - x \cos x}{49x^2} + \frac{7x \cos x - 7 \sin x}{\sin^2 x}$ B) $\frac{dy}{dx} = \frac{\cos x}{7} + \frac{7}{\cos x}$

C) $\frac{dy}{dx} = \frac{x \cos x - \sin x}{7x^2} + \frac{7 \sin x - 7x \cos x}{\sin^2 x}$ D) $\frac{dy}{dx} = \frac{x \cos x + \sin x}{7x^2} + \frac{7 \sin x + 7x \cos x}{\sin^2 x}$

5) A particle moves on the curve $y = 5 \sin^2 x$ such that $\frac{dy}{dt} = 5$. Find the instantaneous rate of change of x with respect to t when $x = \frac{\pi}{4}$ 5) _____

A) 1 B) $\frac{1}{2}$ C) $\frac{5}{2}$ D) 5

Find the extreme values of the function and where they occur.

6) $y = x^3 - 12x + 2$ 6) _____

A) Local maximum at (2, –14), local minimum at (–2, 18).

B) Local maximum at (–2, 18), local minimum at (2, –14).

C) Local maximum at (0, 0).

D) None

Solve the problem.

7) A company is constructing an open–top, square–based, rectangular metal tank that will have a volume of 46.5 ft^3. What dimensions yield the minimum surface area? Round to the nearest tenth, if necessary. 7) _____

A) 9.6 ft by 9.6 ft by 0.5 ft

B) 4.5 ft by 4.5 ft by 2.3 ft

C) 5.2 ft by 5.2 ft by 1.7 ft

D) 3.6 ft by 3.6 ft by 3.6 ft

Find the derivative.

8) $y = \int_0^{\tan x} \sqrt{t}\, dt$ 8) _____

A) $\frac{2}{3}\tan^{3/2} x$ B) $\sec x \tan^{3/2} x$ C) $\sec^2 x \sqrt{\tan x}$ D) $\sqrt{\tan x}$

Find the most general antiderivative.

9) $\int \frac{x\sqrt{x} + \sqrt{x}}{x^2}\, dx$ 9) _____

A) C

B) $\frac{2}{\sqrt{x}} - 2\sqrt{x} + C$

C) $2\sqrt{x} - \frac{2}{\sqrt{x}} + C$

D) $-\frac{\sqrt{x}}{2} - \frac{3\sqrt{x}}{2} + C$

Solve the problem. Round your answer, if appropriate.

10) The volume of a sphere is increasing at a rate of 9 cm^3/sec. Find the rate of change of its surface area when its volume is $\frac{32\pi}{3}$ cm^3. (Do not round your answer.) 10) _____

A) 18π cm^2/sec B) 9 cm^2/sec C) $\frac{8}{3}$ cm^2/sec D) 6 cm^2/sec

11) One airplane is approaching an airport from the north at 122 km/hr. A second airplane approaches from the east at 188 km/hr. Find the rate at which the distance between the planes changes when the southbound plane is 35 km away from the airport and the westbound plane is 17 km from the airport. 11) _____

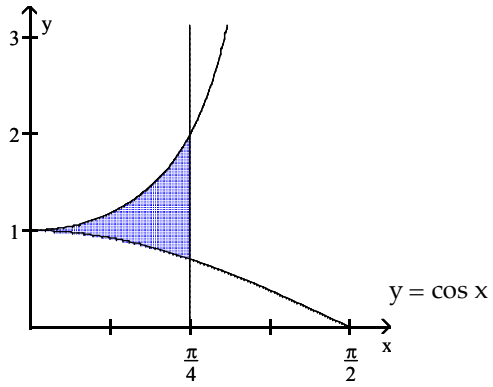
A) –288 km/hr B) –384 km/hr C) –192 km/hr D) –96 km/hr

12) A man 6 ft tall walks at a rate of 3 ft/sec away from a lamppost that is 23 ft high. At what rate is the length of his shadow changing when he is 70 ft away from the lamppost? (Do not round your answer) 12) _____

A) 35 ft/sec B) $\frac{18}{29}$ ft/sec C) $\frac{18}{17}$ ft/sec D) $\frac{9}{29}$ ft/sec

Find the area of the shaded region.

13) $y = \sec^2 x$ 13) _____



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

Use the substitution formula to evaluate the integral.

14) $\int_0^{\pi/8} (1 + e^{\tan 2x}) \sec^2 2x \, dx$ 14) _____

A) $-\frac{e}{2}$ B) e C) $\frac{e}{2}$ D) 2e

Evaluate the integral.

15) $\int \frac{x \, dx}{(7x^2 + 3)^5}$ 15) _____

A) $-\frac{7}{3}(7x^2 + 3)^{-4} + C$ B) $-\frac{1}{14}(7x^2 + 3)^{-6} + C$

C) $-\frac{7}{3}(7x^2 + 3)^{-6} + C$ D) $-\frac{1}{56}(7x^2 + 3)^{-4} + C$

Find y ′.

16) $y = (5x^3 + 3)(2x^7 - 8)$ 16) _____

A) $20x^9 + 42x^6 - 120x^2$ B) $100x^9 + 42x^6 - 120x^2$

C) $20x^9 + 42x^6 - 120x$ D) $100x^9 + 42x^6 - 120x$

Find the derivative of the function.

17) $g(x) = \dfrac{x^2 + 5}{x^2 + 6x}$ 17) _____

A) $g'(x) = \dfrac{4x^3 + 18x^2 + 10x + 30}{x^2(x + 6)^2}$

B) $g'(x) = \dfrac{6x^2 - 10x - 30}{x^2(x + 6)^2}$

C) $g'(x) = \dfrac{x^4 + 6x^3 + 5x^2 + 30x}{x^2(x + 6)^2}$

D) $g'(x) = \dfrac{2x^3 - 5x^2 - 30x}{x^2(x + 6)^2}$

18) $h(x) = \left(\dfrac{\cos x}{1 + \sin x}\right)^5$ 18) _____

A) $h'(x) = -5\left(\dfrac{\sin x}{\cos x}\right)^4$

B) $h'(x) = \left(-\dfrac{4 \sin x}{\cos x}\right)\left(\dfrac{\cos x}{1 + \sin x}\right)^4$

C) $h'(x) = 5\left(\dfrac{\cos x}{1 + \sin x}\right)^4$

D) $h'(x) = \dfrac{-5 \cos^4 x}{(1 + \sin x)^5}$

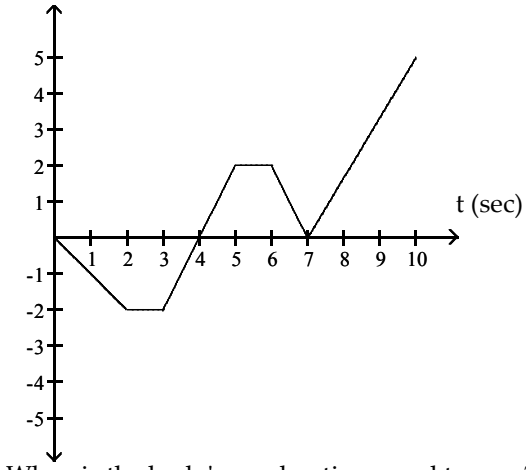
Use implicit differentiation to find dy/dx.

19) $xy + x + y = x^2y^2$ 19) _____

A) $\dfrac{2xy^2 - y - 1}{-2x^2y + x + 1}$ B) $\dfrac{2xy^2 + y}{2x^2y - x}$ C) $\dfrac{2xy^2 - y}{2x^2y + x}$ D) $\dfrac{2xy^2 + y + 1}{-2x^2y - x - 1}$

The figure shows the velocity v or position s of a body moving along a coordinate line as a function of time t . Use the figure to answer the question.

20) v (ft/sec) 20) _____



When is the body's acceleration equal to zero?

A) $t = 2, t = 3, t = 5, t = 6$

B) $0 < t < 2, 6 < t < 7$

C) $t = 0, t = 4, t = 7$

D) $2 < t < 3, 5 < t < 6$

Answer Key
Testname: MATH 1540 FINAL EXAM-PRACTICE

1) D
2) B
3) B
4) C
5) A
6) B
7) B
8) C
9) C
10) B
11) C
12) C
13) A
14) C
15) D
16) B
17) B
18) D
19) A
20) D