

Practice Final Exam:

Chapter 2: Limits and their properties:

1) Find the limit if it exists

$$\text{a) } \lim_{x \rightarrow 4} \sqrt{x+12}$$

$$\text{b) } \lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$$

$$\text{c) } \lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$$

2) Find the x-values (if any) at which f is not continuous. Which of the discontinuities are removable?

$$\text{a) } f(x) = \frac{2x}{x^2 - x}$$

3) Determine the vertical asymptotes of the function $f(x) = \frac{x-3}{x-2}$.

$$\text{Find the limit } \lim_{x \rightarrow 2^+} \frac{x-3}{x-2}$$

$$\text{Find the limit } \lim_{x \rightarrow 2^-} \frac{x-3}{x-2}$$

- 4) Use the intermediate value theorem to show that $f(x) = 2x^3 - 3$ has a zero in the interval $[1,2]$.

Chapter 3 Differentiation.

- 5) Find the derivative of $f(x)=x$ by the limit process.

- 6) Find the derivative of the following functions:

a) $f(x) = 3 \cos(x) - 4e^x$

b) $f(x) = 3x^4$

c) $f(x) = 6\sqrt{x} + 3\sqrt[3]{x}$

d) $f(x) = (3x^2 + 7)(x^2 - 2x + 3)$

e) $f(x) = x^2 \sin(x)$

f) $f(x) = \frac{x+1}{x-1}$

g) $f(x) = \frac{x^2}{\cos x}$

h) $f(x) = \sqrt{1-x^2}$

i) $f(x) = \sin(x^2 + 1)$

j) $f(x) = x\sqrt{\ln x}$

k) $f(x) = e^{2x^2}$

- 7) Find the equation of the tangent line to the graph of the $f(x) = \sin(x) + \cos(x)$ at the point $(0,1)$
- 8) The position function of a particle moving along the x-axis is $x(t) = t^2 - 3t + 2$
- a) Find the position of the particle when $t=12$.
 - b) Find the velocity of the particle when $t=12$.
 - c) Find the acceleration of the particle when $t=12$.
- 9) Use implicit differentiation to find dy/dx for $x^2 + 3xy + y^2 = 10$

Chapter 4 Applications of Differentiation

- 10) Analyze and sketch a graph of the function. Label any intercepts, relative extrema, points of inflection, and asymptotes.
- a) $y = \frac{x^2}{x^2 + 3}$
 - b) $y = x\sqrt{4-x}$
- 11) Which points on the graph $y = 9 - x^2$ are closest to the origin $(0,0)$
(Hint:pg.261 in your book)
- 12) Use differentials to approximate $\sqrt{24.5}$

Chapter 5 Integration

13) Find the indefinite integral

$$a) \int (x + 3) dx$$

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

$$c) \int \frac{1}{x} dx$$

$$d) \int e^x dx$$

$$e) \int (2 \sin x + 3 \cos x) dx$$

$$f) \int 2 dx$$

$$g) \int dt$$

$$h) \int (\theta^2 + \sec^2 \theta) d\theta$$

14) Solve the differential equation: $f'(x) = 4x + 4$, $f(0) = 1$

15) Use the fundamental theorem of Calculus to evaluate the following definite integrals.

$$a) \int_0^4 (2 + x) dx$$

$$b) \int_{-2}^2 (x^4 + 2x^2 - 5) dx$$

$$c) \int_0^{\pi} (\sin \phi) d\phi$$

$$d) \int_0^2 (e^x + x) dx$$

16) Find the area of the region bounded by the graphs of the equations

$$a) y = 3x^2 + 1, x = 0, x = 2, y = 0$$

$$b) y = 1 + \sqrt[3]{x}, x = 0, x = 8, y = 0$$

17) Find the following indefinite integrals

$$a) \int (1+2x)^4 (2) dx$$

$$b) \int \frac{x^2}{(9-x^3)^2} dx$$

$$c) \int \frac{x^3}{\sqrt{1+x^4}} dx$$

18) Evaluate the definite integrals

$$a) \int_{-1}^1 x(x^2+1) dx$$

$$b) \int_0^1 e^{-2x} dx$$

$$c) \int_1^5 \frac{x}{\sqrt{2x-1}} dx$$