

CALCULUS 2

Name: KEY

CHAPTERS 3&4 PRACTICE TEST

Find the derivative of each of the following.

1. $y = 4x^5 - 6x + 9 + \frac{5}{x} + \sqrt{x}$

$$y' = 20x^4 - 6 - \frac{5}{x^2} + \frac{1}{2\sqrt{x}}$$

3. $y = x^2 \sqrt{x}$

$$y' = \frac{5}{2} \sqrt{x^3}$$

5. $y = \frac{2x-1}{x^2+1}$

$$y' = \frac{-2x^2+2x+2}{(x^2+1)^2}$$

7. $y = 2\sin x - 6\cot x$

$$y' = 2\cos x + 6\csc^2 x$$

9. $y = \frac{\sin x - \cos^2 x}{\cos x} = \tan x - \cos x$

$$y' = \sec^2 x + \sin x$$

11. $y = 3x + x \csc x$

$$y' = 3 - x \csc x \cot x + \csc x$$

13. $y = \sin^3 x + 6x^4$

$$y' = 3\cos x \sin^2 x + 24x^3$$

15. $y = (2x-5)^3(x^2-5x)^6$

$$y' = (30x^2 - 150x + 150)(2x-5)^2(x^2-5x)^5$$

17. $y = \cos^5(4x^2 + 1)$

$$y' = -40x \sin(4x^2+1) \cos^4(4x^2+1)$$

19. $5x^2 - xy = y + 2x$

$$\frac{dy}{dx} = \frac{10x-y-2}{1+x}$$

21. Find the equation of the tangent to $y^2 + 2y = 2x + 1$ at $(7, 3)$.

$$2y \frac{dy}{dx} + 2 \frac{dy}{dx} = 2$$

$$8 \frac{dy}{dx} = 2$$

$$y = \frac{1}{4}x + \frac{5}{4}$$

2. $y = 4\pi^3 - 3x$

$$y' = -3$$

4. $y = \frac{7x^5 - 2x^3}{x^6}$

$$y' = -\frac{7}{x^2} + \frac{6}{x^4}$$

6. $y = \frac{-3}{(x+5)(3x-1)}$

$$y' = \frac{18x+42}{(3x^2+14x-5)^2}$$

8. $y = \frac{3\sec^2 x - 3\tan^2 x}{\csc x} = \frac{3}{\csc x} = 3\sin x$

$$y' = 3\cos x$$

10. $y = \frac{\cos x}{1+\cos x}$

$$y' = \frac{-\sin x}{(1+\cos x)^2}$$

12. $y = (1-\frac{x}{2})^5$

$$y' = -\frac{5}{2}(1-\frac{x}{2})^4$$

14. $y = \cot(4x)$

$$y' = -4\csc^2(4x)$$

16. $y = \left(\frac{3x-2}{x-1}\right)^3$

$$y' = -3 \frac{(3x-2)^2}{(x-1)^4}$$

18. $\sec y = x$

$$\frac{dy}{dx} = \cos y \cot y$$

20. $\cos(x^2 y) + 2y = x$

$$\frac{dy}{dx} = \frac{1+2x^2 \sin(x^2 y)}{2-x^4 \sin(x^2 y)}$$

22. Find the equation(s) of the horizontal tangent(s)

to $y = x^5 - 15x^3 + 2$.

$$0 = 5x^4 - 45x^2$$

$$x = 0, x = \pm 3$$

$$y = 2, y = -160, y = 164$$

Identify the intervals on which the graph of f is increasing and decreasing and concave upward and concave downward, and find the coordinates of any local extreme points and points of inflection.

Then graph the general shape of the function.

23. $f(x) = -3x^4 - 8x^3 - 6$

$$f'(x) = \frac{-12x^3 - 24x^2}{}$$

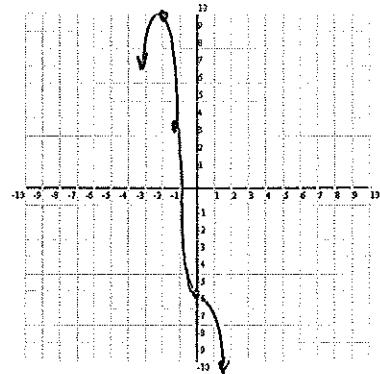
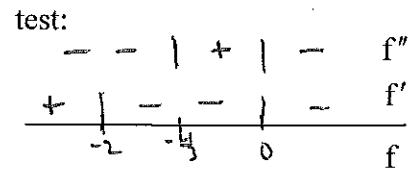
critical points: $(0, -6), (-2, 10)$

increasing: $(-\infty, -2)$
decreasing: $(-2, \infty)$
local max(s): $(-2, 10)$
local min(s): none

$$f''(x) = \frac{-36x^2 - 48x}{}$$

critical points: $(0, -6), \left(-\frac{4}{3}, \frac{94}{27}\right)$

concave up: $\left(-\frac{4}{3}, 0\right)$
concave down: $(-\infty, -\frac{4}{3}), (0, \infty)$
pt(s) of inflection: $\left(-\frac{4}{3}, \frac{94}{27}\right), (0, -6)$



24. $f(x) = 5x^{2/5} - 2x$

$$f'(x) = \frac{10x^{-3/5}}{5} - 2$$

critical points: $(0, 0), (1, 3)$

increasing: $(0, 1)$
decreasing: $(-\infty, 0), (1, \infty)$
local max(s): $(1, 3)$
local min(s): $(0, 0)$

$$f''(x) = \frac{-6}{5}x^{-8/5}$$

critical points: $(0, 0)$

concave up: N/A
concave down: $(-\infty, \infty)$
pt(s) of inflection: none

