practice1680a

instructions here

1. Find the limits
   (a) $\lim_{x\to 1^-} \frac{x+1}{x-1}$
   (b) $\lim_{x\to 3} 5$
   (c) $\lim_{x\to 2} \sqrt{2x^3-3}$
   (d) $\lim_{x\to -1} \frac{x^3+1}{x+1}$
2. Given that $\lim_{x\to 1} f(x) = 3$ and $\lim_{x\to 1} g(x) = 4$, find
   (a) $\lim_{x\to 1} f(x)g(x)$
   (b) $\lim_{x\to 1} \frac{f(x)+1}{g(x)-3}$
   (c) $\lim_{x\to 1} \frac{1}{\sqrt{f(x)^2+g(x)^2}}$
3. Determine the values of x for which the function is continuous
   (a) $f(x) = \frac{2}{x^2+1}$
   (b) $f(x) = \frac{x+1}{x-1}$
   (c) $f(x) = \frac{x^3+1}{x+1}$
4. let $f(x) = \frac{1}{x-1}$
   (a) find the derivative f' of f.
   (b) find the equation of the line tangent to the graph of $y = f(x)$ at the point $(1, -\frac{1}{2})$
5. use derivative rules to find derivatives
   (a) $f(x) = (2x)^3$
   (b) $f(x) = \frac{1}{\sqrt{x(x-1)}}$
   (c) $f(x) = \frac{x^2-2x}{x}$
   (d) $f(x) = 3x^{\frac{1}{2}}$
   (e) $f(x) = x\sqrt{x} + \frac{1}{x\sqrt{x}}$
   (f) $f(x) = \frac{1+x^2}{1-x^2}$
   (g) $f(x) = (3x^2-1)(x^2-\frac{1}{x})$
   (h) $f(x) = \sqrt{\frac{1+x^2}{x^2-1}}$
6. Suppose that f and f are functions with $f(1) = 2, f'(1) = -1, g(1) = -2, g'(1) = 3$
   (a) find $h'(1)$ where $h(x) = f(x)g(x)$

(b) find $h'(1)$ where $h(x) = \frac{xf(x)}{x-g(x)}$

7. Suppose that $f(0) = 6, f'(5) = -2, g(0) = 5$, and $g'(0) - 3$ Let $h = f \circ g$. Find $h'(0)$

8. Find the first second and third derivative of $f(x) = \frac{1}{\sqrt{x+1}}$

9. Find equation of the line tangent to the curve $(x - y - 1)^3 = x$ at the point $(1, -1)$

10. Let $f(x) = x^4 - 2x^2 + 1$

    (a) find $f'(x)$
    (b) find all x values where $f'(x) = 0$
    (c) find the interval(s) where the function is increasing, decreasing
    (d) find $f^{(2)}(x)$
    (e) find all x values where $f^{(2)}(x) = 0$
    (f) find the interval(s) where the function is concave up, and concave down.

11. Find the horizontal and vertical asymptotes of

    (a) $f(x) = \frac{x}{x^2+1}$
    (b) $f(x) = \frac{2x^2+1}{x^2-1}$

12. find the absolute maximum and minimum of $f(x) = x^2 + 1$ on the interval $[-1, 2]$

13. A rectangular garden area needs to be enclosed. The front side will use decorative edging which is already on hand, while the left, right and back will use sturdy edging, which costs .25 per foot. What dimensions will enclose the largest area, given budget of 100.00 for sturdy edging?

14. (5.3) Formula: $A = P(1 + i)^n, i = \frac{r}{m}, n = mt$

    (a) Find the accumulated amount after 4 yrs if $5,000$ is invested at 8 percent compound monthly
    (b) Find the present value of $40,000$ due in 4 years at 6 percent interest compounded semi-annually.

15. (5.4, 5.5) Find derivatives

    (a) $f(x) = \frac{e^x}{x^2}$
    (b) $f(x) = 2(e^x - e^{-x})$
    (c) $f(x) = \ln(\frac{x+1}{x-1})$

16. (5.5) Use logarithmic differentiation to compute the derivative of $f(x) = (x^2 + 1)^x$

17. (5.4, 5.5)

    (a) Find the max and min of $f(x) = (x - 1)e^{-x}$ on the interval $[0, \infty)$
    (b) Find the max and min of $f(x) = x - \ln(x)$ on the interval $[\frac{1}{3}, 2]$
    (c) Find an equation for the line tangent to the graph of $y = x\ln(x)$ at the point $(1, 0)$.

18. (6.1) Find indefinite integrals
    (a) $\int \frac{1+2x^2-x^4}{x^2} dx$
    (b) $\int (1 + x + e^x) dx$
    (c) $\int \sqrt{x} + \frac{1}{\sqrt{x}} dx$
19. (6.1) If $f'(x) = 1 + \frac{1}{x^2}$ and $f(1) = 2$, find $f(x)$
20. (6.2) Use integration by substitution
    (a) $\int \frac{e^x}{1+e^x} dx$
    (b) $\int \frac{\ln(x)}{x} dx$
    (c) $\int x\sqrt{x^2+1} dx$
    (d) $\int xe^{x^2} dx$
    (e) $\int e^{2x} dx$
21. (6.5) Evaluate the definite integrals
    (a) $\int_{-1}^{1} x^2(x^3+1) dx$
    (b) $\int_0^3 x\sqrt{x+1} dx$
    (c) $\int_1^e \frac{1}{x} dx$
22. (6.5) Find the average value of $f(x) = x^2 + x + 1$ on the interval $[0, 3]$
23. (6.6) Find the area described
    (a) Above the x- axis below the curve $y = x^2$ from $x = 1$ to $x = 4$
    (b) Bounded by the curves $g(x) = x^2$ and $f(x) = x^3$
    (c) Bounded by the line $y = 1$ and the curve $y = x^2 - 3$
24. (8.1) For each function, sketch the level curve for the listed z-values.
    (a) $f(x, y) = x^2 + y^2, z = 0, 1, 4, 9$
    (b) $f(x, y) = x + y^2, z = 0, 1, 2$
25. (8.2) Find the first partial derivatives f_x, f_y and the second partial derivatives f_{xx}, f_{yy}, f_{xy} for each of the following
    (a) $f(x, y) = \frac{x}{1+y}$
    (b) $f(x, y) = x^2y + y^2x$
    (c) $f(x, y) = xe^{xy}$
26. (8.3) Find the critical points of each function.
    (a) $f(x, y) = 2x^3 - 3x^2 - 12x + 2y^2 - 6y + 2$

(b) $f(x, y) = xy + \frac{2}{x} + \frac{1}{y}$

(c) $f(x, y) = xy + \ln(x) + 2y^2$

27. (8.3) Use the 2nd derivative test to classify the given critical point

    (a) $f(x, y) = x^2 - y^2 - 2x + 4y + 1$, critical point $(1, -2)$

    (b) $f(x, y) = 4y^3 + x^2 - 12y^2 - 36y + 2$, critical points $(0, -1), (0, 3)$

28. (8.5) Use the method of Lagrange multipliers to find the following

    (a) the min of $f(x, y) = 2x^2 + y^2$ subject to $x + y = 1$

    (b) the max of $f(x, y) = xy$ subject to $2x + 3y = 6$

    (c) the max and min of $x^2 + 2xy + y^2$ subject to $x^2 + y^2 = 1$

29. (8.7) Evaluate the double integrals

    (a) $\int_0^1 \int_1^2 x^x y + y^2 dx dy$

    (b) $\int_0^1 \int_1^x xy + x + 1 dy dx$

    (c) the integral of $f(x, y) = xe^{-y^2}$ over the region bounded by $x = 0 y = x^2$ and $y = 4$

    (d) the integral of $f(x, y) = x + y$ on the region bounded by the x-axis, the y-axis, and the line $x + 2y = 4$