BECA / Dr. Huson / IB Math SL
2 February 2018
Homework: Calculus review Name:

Answer on lined paper. Show work.

Differentiate each function.

1. $f(x) = 2x^3 - x^2 + 6$
2. $g(x) = \frac{1}{x^4}$
3. $h(x) = 3\sqrt{x}$
4. $f(x) = (x-2)(x+2)$
5. $g(x) = \frac{2}{(3x)^2}$
6. $h(x) = 6e^x + \sqrt{x^3}$
7. $f(x) = 6\ln x$
8. $g(x) = \dfrac{\sin x}{\pi}$
9. $h(x) = \log_3 x$

Find the equation of the tangent or normal line to the function at the given point.

10. The tangent to $y = 4x^2$ at $x = 1$
11. The tangent to $y = 3x^2 - e^x$ at $x = 2$
12. The normal line to $y = \ln(e^{x^2})$

Use the product, quotient, or chain rule to differentiate each function.

13. $y = 2xe^x$
14. $y = x^2 \cos x$
15. $f(x) = \dfrac{x^2 - 8}{x + 1}$
16. $g(x) = \dfrac{x}{x^2 - x + 6}$
17. $y = (3x^3 - x^2 + 4)^4$
18. $y = \ln 2x^2 - 3x$

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19. $y = \cos \dfrac{x^3}{\pi}$

20. $y = \sqrt{\cos 3x}$

Local extrema: find the value(s) of x for which the function has a local minimum or maximum.

21. $f(x) = 8x^2 - 24x + 7.$

22. $g(x) = x^3 - 4x^2 - 6x + 5$

23. $h(x) = 2\ln x - x + 4$

Rates of change and motion equations

24. The path of a diver is modeled by the function $s(t) = -4.9t^2 + 4.9t + 10$ where s is the diver's height above the water in meters.

    (a) What is the initial height from which the diver begins her dive?

    (b) What is the initial velocity of the diver?

    (c) What is the maximum height above the water and at what point in time is that height reached?

    (d) When does the diver enter the water?

    (e) At what velocity does she enter the water?

25. The position of an object is given by the function $s(x) = 5\sin x + x$ over the interval $\{0 \leq x \leq 2\pi\}$

    (a) What is the object's initial velocity?

    (b) At what value of x is the object at its maximum distance from its starting point?

    (c) What is its average velocity over the period from $x = 0$ to when it achieves its maximum distance?

    (d) Over what interval is the object moving in the negative direction?

26. A particle moves along a horizontal line with its displacement given by the function $s(t) = 20t - 100\ln t$, for $t > 1$.

    (a) Find the velocity of the particle.

    (b) Over what period is the particle moving to the left?

    (c) Show that the velocity of the particle is always increasing.