

1 Part I - Lines, Exponents and Whatnot

1.1 Things you should know

1. Linear functions. Slope, vertical intercept. Finding the equation of a line.
2. Exponential functions. $P = P_0a^t = P_0e^{kt}$. Exponential growth and decay. Half-life etc.
3. Linear and Exponential regression.
4. Periodic functions.

1.2 Examples

1. Find the equation of the line through the points (2, 7) and (5, 3).
(a) $y = -\frac{1}{7}x + \frac{28}{3}$, (b) $y = \frac{3}{7}x + \frac{5}{3}$, (c) $y = -7x + 2$, (d) $y = -\frac{3}{4}x + \frac{17}{2}$, (e) $y = -\frac{4}{3}x + \frac{29}{3}$.
2. The half-life of strontium-90 is 29 years. In 1964 strontium-90 was released during nuclear weapons testing and was absorbed into people's bones. How many years until 20% of the original amount absorbed remains? (Round to the nearest year)
(a) 52yrs, (b) 58yrs, (c) 67yrs, (d) 35yrs, (e) 94yrs.
3. A product costs \$100 today. If the price decreases by 5% a day, then how much does the product cost a week from today? (Round to the nearest dollar)
(a) \$78, (b) \$65, (c) \$81, (d) \$95, (e) \$70.
4. What is the period of $y = 2 \sin\left(\frac{\pi}{4}t\right) + \pi$?
(a) 2π , (b) 2, (c) π , (d) 8, (e) $\frac{\pi}{4}$.

2 Part II - Derivatives, Derivatives and some more Derivatives.

2.1 Things you should know

1. Finding Derivatives.
2. The value of the derivative as a slope. As an instantaneous rate of change.
3. Relation between the (first or second) derivative and the function.
4. Critical points, Inflection points. Global and Local Extrema.

2.2 Examples

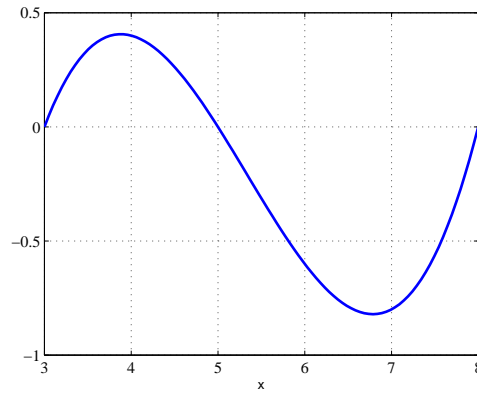
1. If $h(x) = f(g(x))$ then using the following information evaluate $h'(1)$.

$$f(1) = 1, f(2) = 3, f(7) = 6, f(15) = 2, f'(2) = 9, f'(1) = 1$$

$$g(1) = 2, g(2) = 6, g'(1) = 7, g'(2) = 15$$

- (a) 15, (b) 9, (c) 6, (d) 63, (e) 7.
2. If $f(x) = \ln(x^2 + e^x)$ then what is $f'(13)$? (Round to 1 decimal place)
(a) 442, 413.6, (b) 0.5, (c) 0.2, (d) 0.9, (e) 1.0.
 3. Find the slope of the line tangent to $f(x) = \frac{\sin(x)}{e^x}$ at the point where $x = 0$
(a) 1, (b) 2, (c) $\frac{1}{2}$, (d) $-\frac{1}{2}$, (e) -1.
 4. Find the x value where the global (absolute) minimum of $y = (x+2)^2(x-3)$ is attained if $-3 \leq x \leq 3$?
(a) 3, (b) $\frac{4}{3}$, (c) -3, (d) $-\frac{16}{3}$, (e) -2.

5. If the following graph is of $f''(x)$ then where is $f'(x)$ increasing?



- (a) $x > 7$, (b) $5 < x < 7$, (c) $3 < x < 6$, (d) $3 < x < 5$, (e) $4 < x < 8$.

6. Which of the following is an inflection point of $f(x) = e^{-x^2+1}$?

- (a) 1, (b) $\sqrt{5}$, (c) 0, (d) $\frac{1}{\sqrt{2}}$, (e) $\sqrt{35}$.

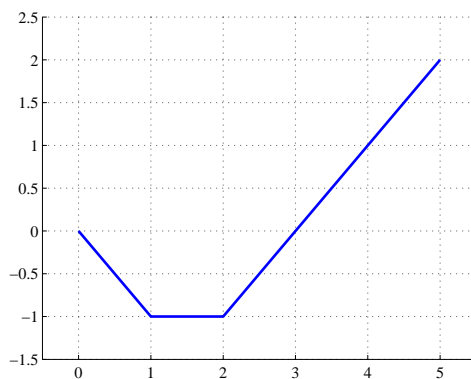
3 Part III - Antiderivatives. Integrals. Reconstructing the function from its derivative.

3.1 Things you should know

1. Finding Antiderivatives.
2. The value of a definite integral as an area.
3. Fundamental Theorem. The definite integral as total change.
4. Relation between the function and its antiderivative = Relation between the derivative and the function.

3.2 Examples

1. Find $\int_0^4 f(x) dx$ if $f(x)$ is given by



- (a) 1, (b) $-\frac{1}{2}$, (c) $-\frac{3}{2}$, (d) $\frac{1}{2}$, (e) 0.
2. The rate at which a population of rabbits on an island is changing is given by $r(t) = 50(e^{-.2t} - e^{-.3t})$ where t is in months. If there are 2 rabbits on the island originally, then how many rabbits are there after 6 months? (Round to the nearest integer).
(a) 36, (b) 38, (c) 48, (d) 40, (e) 34.
 3. Find the area between $y = x^2 - 2x$ and $y = 12 - x$. (Round to 1 decimal place).
(a) 43.2, (b) 53.3, (c) 40.5, (d) 57.2 (e) 54.0.

4. Find the x value where the global (absolute) minimum of $y = (x+2)^2(x-3)$ is attained if $-3 \leq x \leq 3$?
(a) 3, (b) $\frac{4}{3}$, (c) -3 , (d) $-\frac{16}{3}$, (e) -2 .
5. The velocity of a car (in miles per hour) is given by $v(t) = \sin(2t) + \frac{t}{2}$ where t is in hours. If the car starts from home, then how far away from home has it traveled in 2 hours? (Round to 1 decimal place).
(a) 0.87, (b) 1.8, (c) 1.0, (d) 0.83, (e) 2.3.
6. If $f(x) = \ln(x^2 + e^x)$ then what is $f'(13)$? (Round to 1 decimal place)
(a) 442,413.6, (b) 0.5, (c) 0.2, (d) 0.9, (e) 1.0.