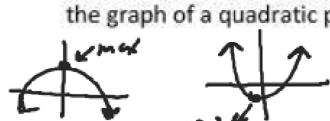
Why are the points (0,0) and (4.25, 7) not considered local minimum or local maximum points for the cubic function you found in problem 2 to model the Section I design for the roller coaster.

Consider the relationship between the degree of a function and the number of local maximum and/or local minimum points on the graph of a function.

a. Give an example of a polynomial function with no local maximum or local minimum point.

$y = mx + b$ $\qquad$ $y = 4$

b. How many local maximum and/or minimum points can there be on the graph of a quadratic polynomial? 1



maximum number of extrema is 1 less than degree.

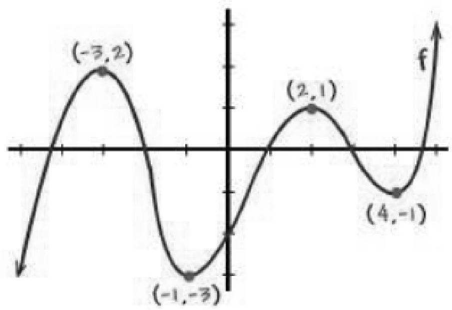
Given the equation, $y = x^3 - 6x^2 + 12x - 3$, how many local max/min would you expect to have? Find them. (2)

Given the equation, $y = x^4 - 9x^2 + 2$, how many local max/min would you expect to have? Find them. (2)

Given the equation, $y = x^5 - 5x^3 + 4x$, how many local max/min would you expect to have? Find them. (24)

What you will learn about:
End Behaviors
Intervals of Increasing/Decreasing

Identify intervals on which the function is decreasing and increasing.



For each function identify the intervals of increasing and decreasing.

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

$f(x) = x^3 - 11x^2 + 39x - 47$

$g(x) = \frac{x^2}{4x+4}$

$h(t) = \frac{3x^2-3}{x^3}$

Describe the end behaviors for each function.

$f(x) = x^3 - 4x^2 + 7$

$g(x) = x^4 - 4x^2 - x - 5$

$h(t) = t^5 - 4t^3 + 5t + 2$

$p(x) = -x^4 + 3x^3 - 5x + 2$

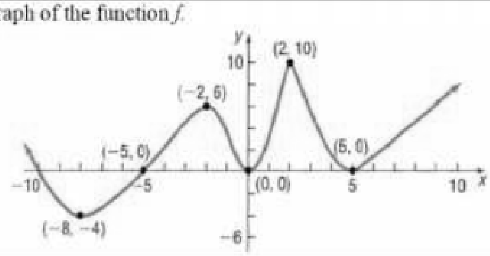
$f(x) = -x^3 - 4x^2 + 4$

$f(x) = (x - 3)(x + 5)(x - 1)$

B) $f(x) = (x - 3)(5 - 6x)(x - 1)$

C) $f(x) = (x-3)^2(x+5)(x-1)$ D) $f(x) = (x-3)(5-6x)^3$

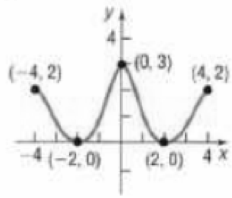
In problems 1-8, use the given graph of the function *f*.



1	Is *f* increasing on the interval $(-8,-2)$?
2	Is *f* increasing on the interval $(2,10)$?
3	List the interval(s) on which *f* is increasing. Justify your answer.
4	List the interval(s) on which *f* is decreasing. Justify your answer.
5	List the value(s) of x at which *f* has a local maximum. Justify your answer.
6	List the value(s) of x at which *f* has a local minimum. Justify your answer.
7	Find the x-intercepts.
8	Find the y-intercepts.

(b) The x- and y- intercepts
(c) The intervals of increase. Justify.
(d) The intervals of decrease. Justify.
(e) The intervals of constant. Justify.

9.



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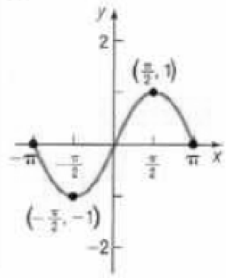

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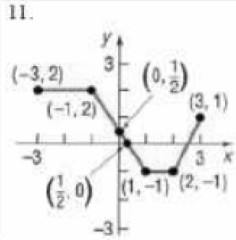

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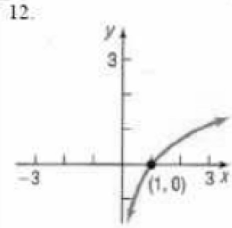
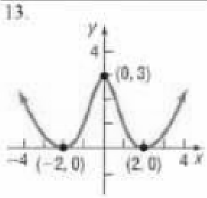


In problems 13-16, the graph of a function f is given. Use the graph to find:

a) The numbers, if any, at which f has a local maximum. What are those local maxima?
b) The numbers, if any, at which f has a local minimum. What are those local minima?

13.



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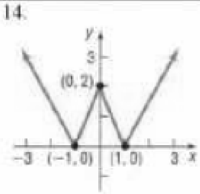

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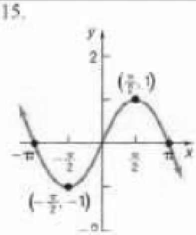

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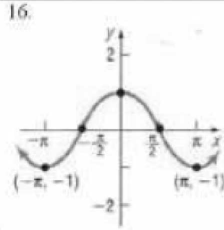

Addition, Subtraction, and Zeros $12- ticket	When a small music venue books a popular band business prospects of events depend on how the ticket sales are set. For example, if the ticket price at x dollars, income and expenses might be estimated as follows. Ticket sale income: $t(x) = -25x^2 + \underline{750x}$ Snack Bar Income: $s(x) = 7{,}500 - 250x$ Concert operating costs: $c(x) = 4{,}750 - 125x$ Snack bar operating costs: $b(x) = 2{,}250 - 75x$ Before the show the manager uses the functions *t(x)* and *s(x)* to estimate total income. a. What income should the manager expect from ticket sales alone if the ticket price is set at $12? What income from snack bar sales? What income from the two sources combine? $t(12) = -25(12)^2 + 750(12)$ $= 5400$ $S(12) = 7500 - 250(12)$ $= 4{,}500$ Total Income = $5400 + 4500$ $9900 b. What rule would define the function *I(x)* that shows how combine income from ticket sales and snack bar sales depends on ticket price? Write a rule for *I(x)* in simplest standard form. $I(x) = t(x) + S(x)$ $= -25x^2 + 750x + 7500 - 250x$ $= -25x^2 + 500x + 7500$ c. What is the degree of *I*(*x*)? How does that compare to the degrees of *t(x)* and *s*(*x*)? Degree $I(x) = 2$ Same as highest degree of $t(x) + S(x)$

$C(x)=4750-125x$ $b(x)=2250-75x$ $9900-4600$ 5300	The manager also uses the functions *c(x)* and *b(x)* to estimate total operating expenses. a. What expenses should the manager expect from concert operations alone if the ticket price is set at \$12? What expense from snack bar operations? What expenses from the two sources combine? $C(12)=4750-125(12)$ $=3250$ $b(12)=2250-75(12)$ $=1350$ Total $=4600$ b. What rule would define the function *E(x)* that shows how combine expense from concert and snack bar operations depends on ticket price? Write a rule for *E(x)* that is in simplest standard form. $E(x)=C(x)+b(x)$ $=4750-125x+2250-75x$ $=-200x+7000$ c. What is the degree for *E(x)*? How does that compare to the degrees of *c(x)* and *b(x)*? Degree of E(x) is 1 Same as C(x) and b(x) Consider the next function *P(x)* defined as *P(x) = I(x) – E(x)*. a. What does *P(x)* tell about the business prospects for the music venue? P(x) tells you profit based off ticket price b. Write two equivalent rules for *P(x)*. • One that shows the separation expressed for income and operating expenses • Another that is in simplest standard form $P(x)=(-25x^2+500x+7500)-(-200x+7000)$ $P(x)=-25x^2+700x+500$ c. What is the degree for *P(x)*? How does that compare to the degrees of *I(x)* and *E(x)*? Degree of P(x) is 2 Highest of the 2 equations

Find the sum and difference for each set of functions and give the degree in each case. Make sure your answer is in standard form.

$f(x)+g(x)$ $\quad$ $f(x)-g(x)$

a. $f(x) = 3x^3 + 5x - 7 \; and \; g(x) = 4x^3 - 2x^2 + 4x + 3$

b. $f(x) = 3x^3 + 4x^2 + 5 \; and \; g(x) = -3x^3 - 2x^2 + 5x$

c. $f(x) = x^4 + 5x^3 - 7x + 5 \; and \; g(x) = 4x^3 - 2x^2 + 5x + 3$

d. $f(x) = 6x^4 + 5x^3 - 7x + 5 \; and \; g(x) = 6x^4 + 5x$