

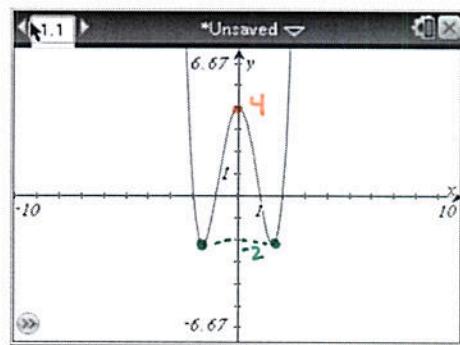
Non-Calculator

- 1) Using the graph on the right, estimate the relative max and min.

relative max : 4

relative min : -2

report
y-value



- 2) Find the domain and range of the following:

a) $f(x) = \sqrt{x-1} + 3$

Domain: $x-1 \geq 0$
 $x \geq 1$

Range: $\sqrt{x-1}$ is ≥ 0
so, $\sqrt{x-1} + 3$ is ≥ 3

Domain: $[1, \infty)$

Range: $[3, \infty)$

b) $k(x) = \sqrt{-2x+1}$

Domain: $-2x+1 \geq 0$
 $-2x \geq -1$
 $x \leq \frac{1}{2}$

Range: $\sqrt{-2x+1}$ is ≥ 0

Domain: $(-\infty, \frac{1}{2}]$

Range: $[0, \infty)$

- 3) Find $(f+g)(x)$ and $(g-f)(x)$ if $f(x) = x^3 - 3x + 5$ and $g(x) = x^2 - 5x - 6$.

$$\begin{aligned}(f+g)(x) &= f(x) + g(x) \\ &= x^3 - 3x + 5 + x^2 - 5x - 6 \\ (f+g)(x) &= x^3 + x^2 - 8x - 1\end{aligned}$$

$$\begin{aligned}(g-f)(x) &= g(x) - f(x) \\ &= x^2 - 5x - 6 - (x^3 - 3x + 5) \\ &= x^2 - 5x - 6 - x^3 + 3x - 5 \\ (g-f)(x) &= -x^3 + x^2 - 2x - 11\end{aligned}$$

- 4) Find $(fg)(x)$ if $f(x) = (x+3)^2$ and $g(x) = x-3$.

$$\begin{aligned}(fg)(x) &= f(x) \cdot g(x) \\ &= (x+3)^2 (x-3) \\ &= (x^2 + 6x + 9)(x-3) \\ &= x^3 - 3x^2 + 6x^2 - 18x + 9x - 27 \\ (fg)(x) &= x^3 + 3x^2 - 9x - 27\end{aligned}$$

- 5) Find $(f \circ g)(x)$ and $(g \circ f)(x)$ if $f(x) = x^2 - 7$ and $g(x) = \sqrt{x+3}$.

$$\begin{aligned}(f \circ g)(x) &= f(g(x)) \\ &= (\sqrt{x+3})^2 - 7 \\ &= x+3-7 \\ (f \circ g)(x) &= x-4\end{aligned}$$

$$\begin{aligned}(g \circ f)(x) &= \sqrt{x^2-7+3} \\ (g \circ f)(x) &= \sqrt{x^2-4}\end{aligned}$$

- 6) Find the inverse of $h(x) = (x-3)^2 + 9$.

$$\begin{aligned}y &= (x-3)^2 + 9 \\ x &= (y-3)^2 + 9 \\ x-9 &= (y-3)^2 \\ \sqrt{x-9} &= \sqrt{(y-3)^2}\end{aligned}$$

$$\pm \sqrt{x-9} = y-3$$

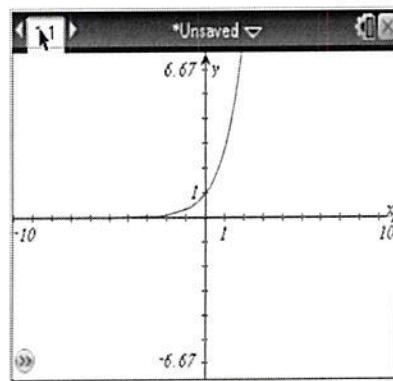
$$\pm \sqrt{x-9} + 3 = y$$

$$f^{-1}(x) = \pm \sqrt{x-9} + 3$$

- 7) Find the parent function that produces the graph on the right.

exponential function

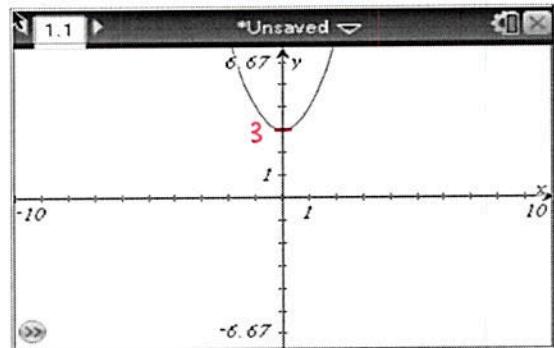
$$y = e^x$$



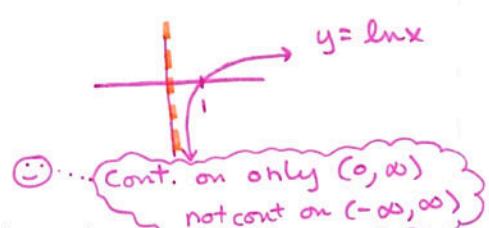
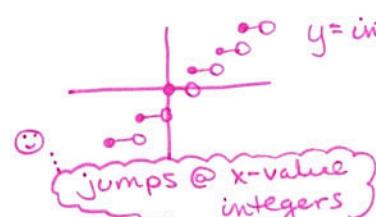
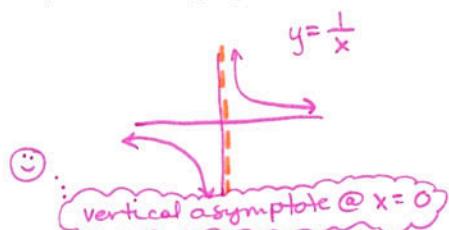
- 8) Find the function that produces the graph on the right.

squaring/quadratic function

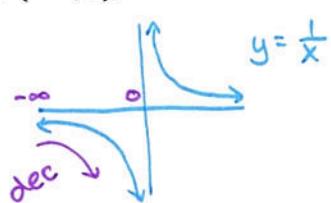
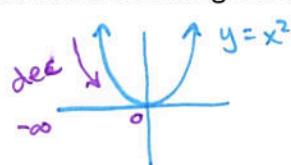
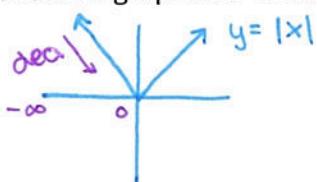
$$y = x^2 + 3$$



- 9) Sketch a graph of 3 functions that are NOT continuous over the Real Numbers. from -\infty to \infty

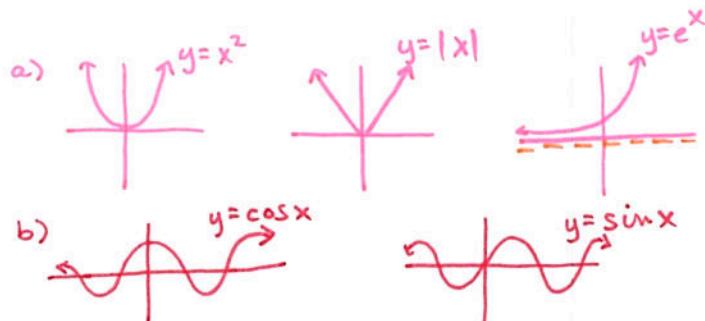
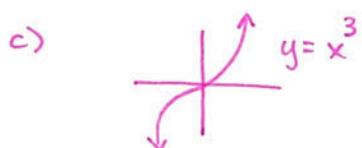


- 10) Sketch a graph of 3 functions that are decreasing on the interval $(-\infty, 0)$.



- 11) Sketch the following:

- a) graphs of 3 functions that are bounded below
- b) graphs of 2 bounded functions
- c) a graph of a function that's NOT bounded



- 12) Describe the transformation of $g(x) = (x - 3)^2 - 5$.

Translate(shift) down 5 units
right 3
and translate(shift) right 3 units

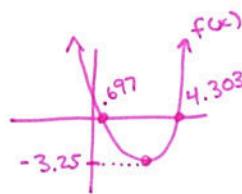
Calculator

13) Find the zeroes of $f(x) = x^2 - 5x + 3$. What is the domain and range of this function?

$$x = 0.697, x = 4.303$$

Domain: $(-\infty, \infty)$

Range: $[-3.25, \infty)$



14) Determine a function that has zeroes @ $\frac{2}{3}, 3$, and 5 .

$$\begin{aligned} & x = \frac{2}{3} \quad x = 3 \quad x = 5 \\ & x - \frac{2}{3} = 0 \quad x - 3 = 0 \quad x - 5 = 0 \\ & 3x - 2 = 0 \end{aligned}$$

$$\begin{aligned} f(x) &= (3x-2)(x-3)(x-5) \\ &= (3x-2)(x^2-8x+15) \\ &= 3x^3 - 2x^2 - 24x^2 + 16x + 45x - 30 \\ f(x) &= 3x^3 - 26x^2 + 61x - 30 \end{aligned}$$

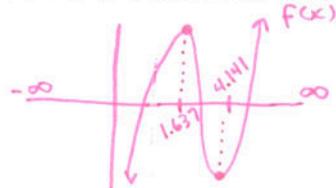
15) What is the end behavior in problem 14?

$$\lim_{x \rightarrow -\infty} f(x) = -\infty \quad \lim_{x \rightarrow \infty} f(x) = \infty$$

16) Determine to 3 decimal places the interval(s) on which the function in problem 14 is decreasing and increasing.

$f(x)$ inc on $(-\infty, 1.637) \cup (4.141, \infty)$

$f(x)$ dec on $(1.637, 4.141)$



17) Perform the following transformation: Reflect $q(x)$ across the x-axis if $q(x) = (x-3)^2 - 5$. Write the new function and call it $p(x)$.

$$\begin{aligned} p(x) &= -q(x) \\ &= -[(x-3)^2 - 5] \\ p(x) &= -(x-3)^2 + 5 \end{aligned}$$

18) What is the best fit regression curve given the data on the right?

Quadratic function

$$y = x^2 - 1$$

# of minutes	3	4	5	6	8
# of cars	8	15	24	35	63

- 19) Graphite Inc. makes tennis racquets. If each racquet costs \$53 to make with fixed overhead costs of \$567,000, what is the best fit regression curve?

$C = \text{cost}$

$x = \# \text{ of racquets}$

$$C(x) = 53x + 567000$$

Linear function

- 20) Clearly identify and state the x -value(s) where the discontinuities occur for:

$$f(x) = \frac{x(x^2-4)}{x^3-2x^2-8x}$$

$$f(x) = \frac{x(x-2)(x+2)}{x(x^2-2x-8)}$$

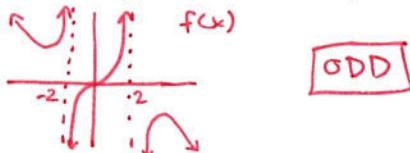
$$= \frac{x(x-2)(x+2)}{x(x-4)(x+2)}$$

discontinuities when
denominator = 0
 $x(x-4)(x+2) = 0$
 $x=0, x=4, x=-2$

notice:
 $f(x) = \frac{x(x-2)(x+2)}{x(x-4)(x+2)}$
 $\downarrow \quad \downarrow \quad \downarrow$
 $x=0, x=-2 \text{ removable}$
 $x=4 \text{ nonremovable}$

- 21) Tell whether each of the following functions is odd, even, or neither:

a) $f(x) = \frac{x^3}{4-x^2}$



ODD

b) $g(x) = x^2 - 3$



EVEN

c) $h(x) = x^2 - 2x - 2$



NEITHER