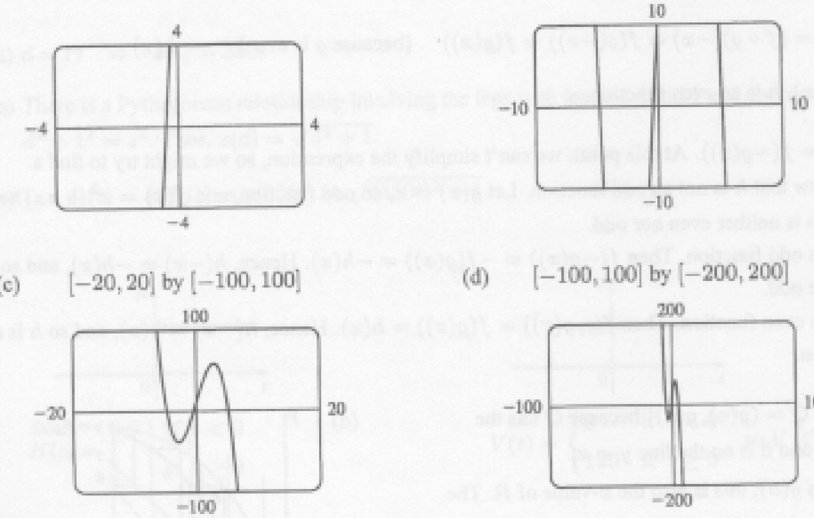
Solutions #4
Math 1a

Section 1.4 #1,4,16,72

1. $f(x) = 10 + 25x - x^3$

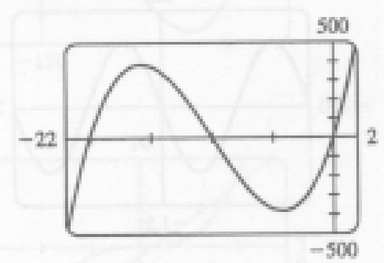
(a) $[-4, 4]$ by $[-4, 4]$ (b) $[-10, 10]$ by $[-10, 10]$

(c) $[-20, 20]$ by $[-100, 100]$ (d) $[-100, 100]$ by $[-200, 200]$



The most appropriate graph is produced in viewing rectangle (c) because the maximum and minimum points are fairly easy to see and estimate.

4. An appropriate viewing rectangle for $f(x) = x^3 + 30x^2 + 200x$ should include the high and low points.



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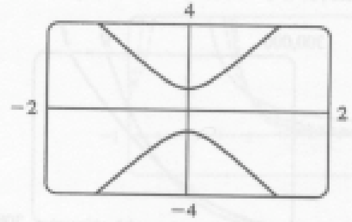
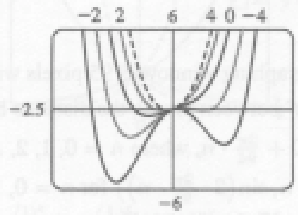
16. $y^2 - 9x^2 = 1 \quad \Leftrightarrow \quad y^2 = 1 + 9x^2 \quad \Leftrightarrow \quad y = \pm\sqrt{1 + 9x^2}$



27. $f(x) = x^4 + cx^2 + x$. If $c < 0$, there are three humps: two minimum points and a maximum point. These humps get flatter as c increases, until at $c = 0$ two of the humps disappear and there is only one minimum point. This single hump then moves to the right and approaches the origin as c increases.



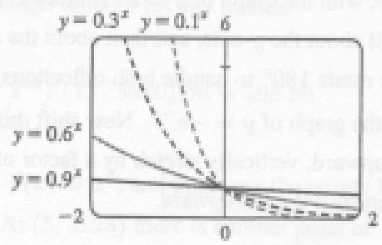
Section 1.5 #2,6,14,24

2. (a) The number e is the value of a such that the slope of the tangent line at $x = 0$ on the graph of $y = a^x$ is exactly 1.

(b) $e \approx 2.71828$

(c) $f(x) = e^x$

6. Each of the graphs approaches ∞ as $x \to -\infty$, and each approaches 0 as $x \to \infty$. The smaller the base, the faster the function grows as $x \to -\infty$, and the faster it approaches 0 as $x \to \infty$.



14. (a) This reflection consists of first reflecting the graph about the x-axis (giving the graph with equation $y = -e^x$) and then shifting this graph $2 \cdot 4 = 8$ units upward. So the equation is $y = -e^x + 8$.

(b) This reflection consists of first reflecting the graph about the y-axis (giving the graph with equation $y = e^{-x}$) and then shifting this graph $2 \cdot 2 = 4$ units to the right. So the equation is $y = e^{-(x-4)}$.

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24. (a) Sixty hours represents 4 half-life periods.

$2 \cdot \left(\frac{1}{2}\right)^4 = \frac{1}{8}$ g

(b) In t hours, there will be $t/15$ half-life periods.

The initial mass is 2 g, so the mass y at time t is $y = 2 \cdot \left(\frac{1}{2}\right)^{t/15}$.

(c) 4 days $= 4 \cdot 24 = 96$ hours. $t = 96 \Rightarrow$

$y = 2 \cdot \left(\frac{1}{2}\right)^{96/15} \approx 0.024$ g

(d) $y = 0.01 \Rightarrow t \approx 114.7$ hours