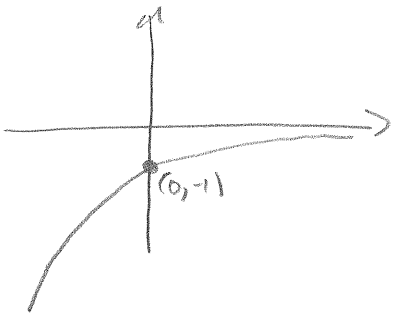
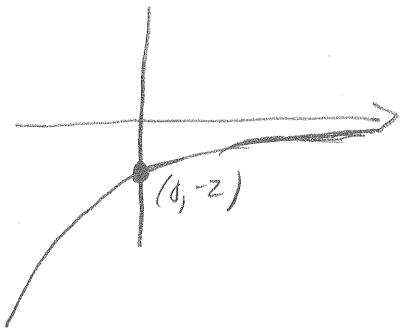
6.2

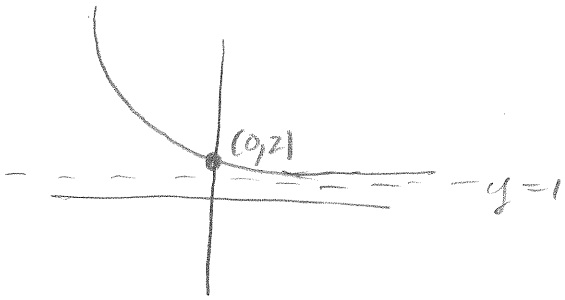
2. a) $y = -e^{-x}$



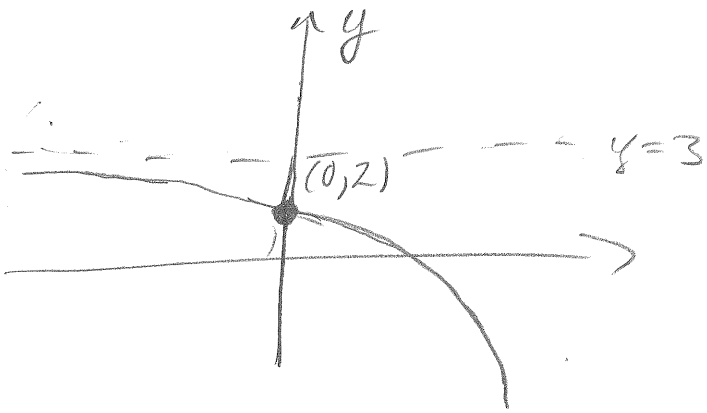
b) $y = -2e^{-x}$ 5



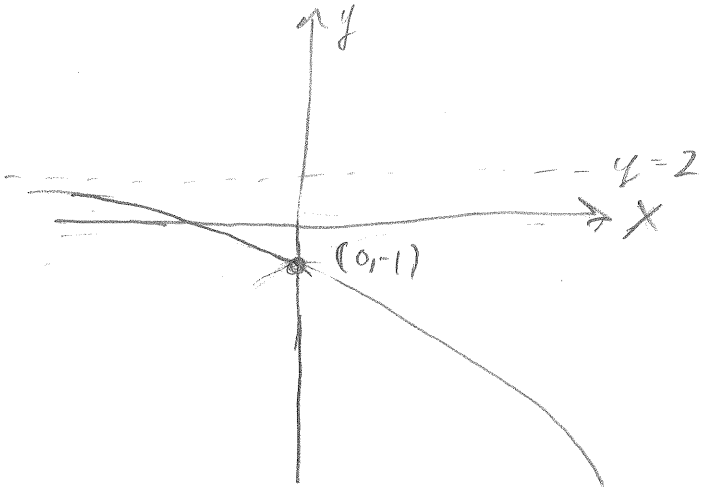
c) $y = e^{-x} + 1$



d) $y = 3 - e^{x}$



e) $y = 2 - 3e^{x}$



$2 - 3 = -1$

6. Simplify

3

a) $(e^{-x})^2 = e^{-2x}$

b) $\sqrt{e^{2x}} = (e^{2x})^{1/2}$

$= e^{x}$.

c) $\dfrac{e^{x}+1}{e^{2x}-1} = \dfrac{e^{x}+1}{(e^{x})^2-1}$

$= \dfrac{e^{x+1}}{(e^{x}+1)(e^{x}-1)}$

$= \dfrac{1}{e^{x}-1}$.

7.1 2. $f(x) = x^2+1$, $g(x) = \sin(x)$, $s(t) = 2t-3$

5

a) $f(g(x)) = f(\sin(x)) = \sin^2(x)+1$

b) $f(s(t)) = f(2t-3) = (2t-3)^2+1 = 4t^2-12t+9+1$

$= 4t^2-12t+10$.

c) $g(s(t)) = g(2t-3) = \sin(2t-3)$.

d) $g(f(x)) = g(x^2+1) = \sin(x^2+1)$.

e) $g(g(x)) = \sin(\sin(x))$.

4. $f(x) = x^3+4x$, $g(x) = \sqrt{x+1}$, $h(x) = \cos(x)$

2

a) $f(g(h(x))) = f(g(\cos(x))) = f(\sqrt{\cos(x)+1}) = (\sqrt{\cos(x)+1})^3 + 4(\sqrt{\cos(x)+1})$

b) $f(h(g(x))) = f(h(\sqrt{x+1})) = f(\cos(\sqrt{x+1})) = \cos^3(\sqrt{x+1}) + 4\cos(\sqrt{x+1})$.

7.4 Find the inverse of the given function, if it exists.

2. $k(x) = \frac{x}{x+1}$

$$y = \frac{x}{x+1}$$

$$\Rightarrow y(x+1) = x$$

$$\Rightarrow xy + y = x$$

$$\Rightarrow y = x - xy = x(1-y)$$

$$\Rightarrow \frac{y}{1-y} = x.$$

$$\Rightarrow f^{-1}(x) = \frac{x}{1-x}.$$

6. $f(w) = w^2/w^2+1$

$$y = \frac{w^2}{w^2+1}$$

$$\Rightarrow y(w^2+1) = w^2$$

$$\Rightarrow yw^2 + y = w^2$$

$$\Rightarrow y = w^2 - yw^2$$

$$\Rightarrow y = w^2(1-y)$$

$$\Rightarrow \frac{y}{1-y} = w^2$$

$$\Rightarrow w = \pm\sqrt{\frac{y}{1-y}}$$

However, this is <u>not</u> a function, so no inverse exists.

8.2

6. Solve $\log_3(x-3)=2$.

$\log_3(x-3)=2$

$\Rightarrow 3^{\log_3(x-3)}=3^2$

$\Rightarrow x-3=9$

$\Rightarrow x=12.$

8. Solve $\log_9 x^2=1/2$

$\log_9(x^2)=1/2$

$\Rightarrow 9^{\log_9(x^2)}=9^{1/2}$

$\Rightarrow x^2=3$

$\Rightarrow x=\pm\sqrt{3}.$

8.3

6. Solve $\log_2(x^2)-\log_2(3x-8)=2$

$2=\log_2(x^2)-\log_2(3x-8)=\log_2\left(\frac{x^2}{3x-8}\right)$

$\Rightarrow 2^2=2^{\log_2\left(\frac{x^2}{3x-8}\right)}$

$\Rightarrow 4=\frac{x^2}{3x-8}$

$\Rightarrow x^2=4(3x-8)=12x-32$

$\Rightarrow x^2-12x+32=0$

$\Rightarrow (x-8)(x-4)=0$

$\Rightarrow x=4$ or $x=8.$

10. Solve $\log(x) - \log(x-1) - 1 = 0$

$\Rightarrow \log_{10}(x) - \log_{10}(x-1) = 1$

$\Rightarrow \log_{10}\left(\frac{x}{x-1}\right) = 1$

$\Rightarrow 10^{\log_{10}\left(\frac{x}{x-1}\right)} = 10^1$

$\Rightarrow \frac{x}{x-1} = 10$

$\Rightarrow x = 10(x-1) = 10x - 10$

$\Rightarrow 10 = 10x - x = 9x$

$\Rightarrow x = 10/9.$

8.4

8. Solve $e^{x^2+4x-5} = 1$

$\log_e(e^{x^2+4x-5}) = \log_e(1)$

$\Rightarrow x^2 + 4x - 5 = 0$

$\Rightarrow (x+5)(x-1) = 0$

$\Rightarrow x = -5$ or $x = 1.$

14. Solve $\ln(x) - \ln(\sqrt{x}) - \frac{1}{2} = 0$

$\frac{1}{2} = \ln(x) - \ln(\sqrt{x}) = \ln\left(\frac{x}{\sqrt{x}}\right) = \ln(\sqrt{x}) = \ln(x^{1/2}) = \frac{1}{2}\ln(x)$

$\Rightarrow \ln(x) = 1$

$\Rightarrow e^{\ln(x)} = e^1$

$\Rightarrow x = e.$