

Practice Test IIB Solutions

Problem I

Let's compute the derivative of the function. this is a chain rule computation. Using Maple to generate the correct answer, we have, first enter the function, and then differentiate it.

```
> f := sqrt(1/sqrt(8+x^2)+1);
```

$$f := \sqrt{\frac{1}{\sqrt{8+x^2}} + 1}$$

```
> diff(f,x);
```

$$-\frac{1}{2} \frac{x}{\sqrt{\frac{1}{\sqrt{8+x^2}} + 1} (8+x^2)^{(3/2)}}$$

```
> subs(x=1,%);
```

$$-\frac{1}{162} \frac{\sqrt{9}}{\sqrt{\frac{1}{9}\sqrt{9} + 1}}$$

```
> simplify(%);
```

$$-\frac{1}{108} \sqrt{3}$$

You were given that $(1\sqrt{3}/2)$ is on the graph, but let's check it.

```
> subs(x=1,f);
```

$$\sqrt{\frac{1}{9}\sqrt{9} + 1}$$

```
> simplify(%);
```

$$\frac{2}{3}\sqrt{3}$$

Thus, the equation for the tangent line is:

```
> y := 2/sqrt(3) - sqrt(3)/108*(x-1);
```

$$y := \frac{2}{3}\sqrt{3} - \frac{1}{108}\sqrt{3}(x-1)$$

To find the y-intercept of this line, evaluate y at x=0:

> subs(x=0, y);

$$\frac{73}{108}\sqrt{3}$$

To find the x-intercept, solve y=0 for x:

> solve(y=0);

73

Now that 1/2 base times height:

> (1/2)*(%)*(%%);

$$\frac{5329}{216}\sqrt{3}$$

Problem II:

(a) B (b) C (c) B (d) A (e) B (f) A

Problem IV:

$c^2 = a^2 + b^2$. Let c be the length of the line, b the height of the dock, and a the distance from the boat to the dock.

Then $2cc' = 2aa'$ or $c' = (a/c)a'$

We are given $a' = 8$ and $c = 30$ but we need

> a := sqrt(900-36);

$$a := 12\sqrt{6}$$

> cprime := (a/30)*8;

$$cprime := \frac{16}{5}\sqrt{6}$$

Problem V:

(a) $f(f(x))' = f'(f(x)) * f'(x) = 9$ in this case.

now for (B),(c) and (d):

```
> diff(sin(cos(x))+sin(x)),x);
```

$$\cos(\cos(x) + \sin(x)) (-\sin(x) + \cos(x))$$

```
> diff(x/sqrt(1 + x^2),x);
```

$$\frac{1}{\sqrt{1+x^2}} - \frac{x^2}{(1+x^2)^{(3/2)}}$$

```
> simplify(%);
```

$$\frac{1}{(1+x^2)^{(3/2)}}$$

```
> diff(diff(cos(e^(-x^2)),x),x);
```

$$-4 \cos(e^{-x^2}) (e^{-x^2})^2 x^2 \ln(e)^2 - 4 \sin(e^{-x^2}) e^{-x^2} x^2 \ln(e)^2 + 2 \sin(e^{-x^2}) e^{-x^2} \ln(e)$$

```
> simplify(%);
```

$$-4 \cos(e^{-x^2}) e^{-2x^2} x^2 \ln(e)^2 - 4 \sin(e^{-x^2}) e^{-x^2} x^2 \ln(e)^2 + 2 \sin(e^{-x^2}) e^{-x^2} \ln(e)$$

```
>
```